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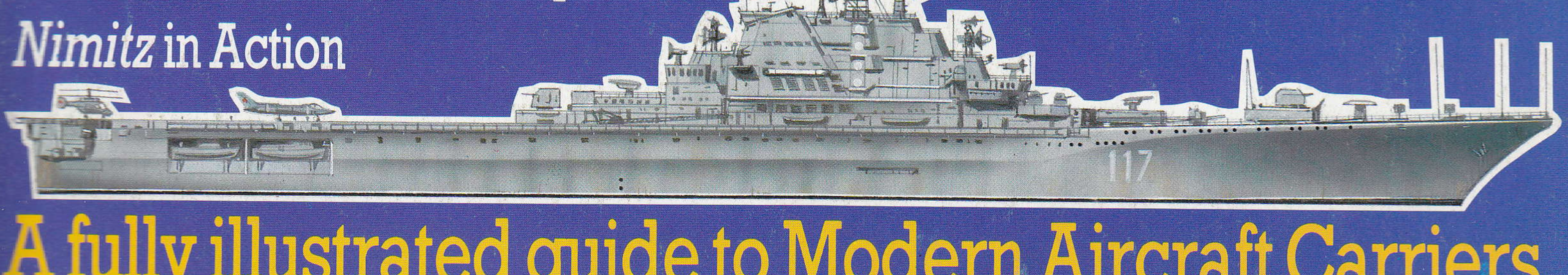

A fully illustrated guide to Modern Aircraft Carriers

WAR MACHINE

Volume 2 Issue 24

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War Machine
Aerospace Publishing Ltd
10 Barley Mow Passage
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Managing Editor: Stan Morse
Editorial: Trisha Palmer
Chris Bishop
Chris Chant

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Artists:
Tony Gibbons
Jack Woods

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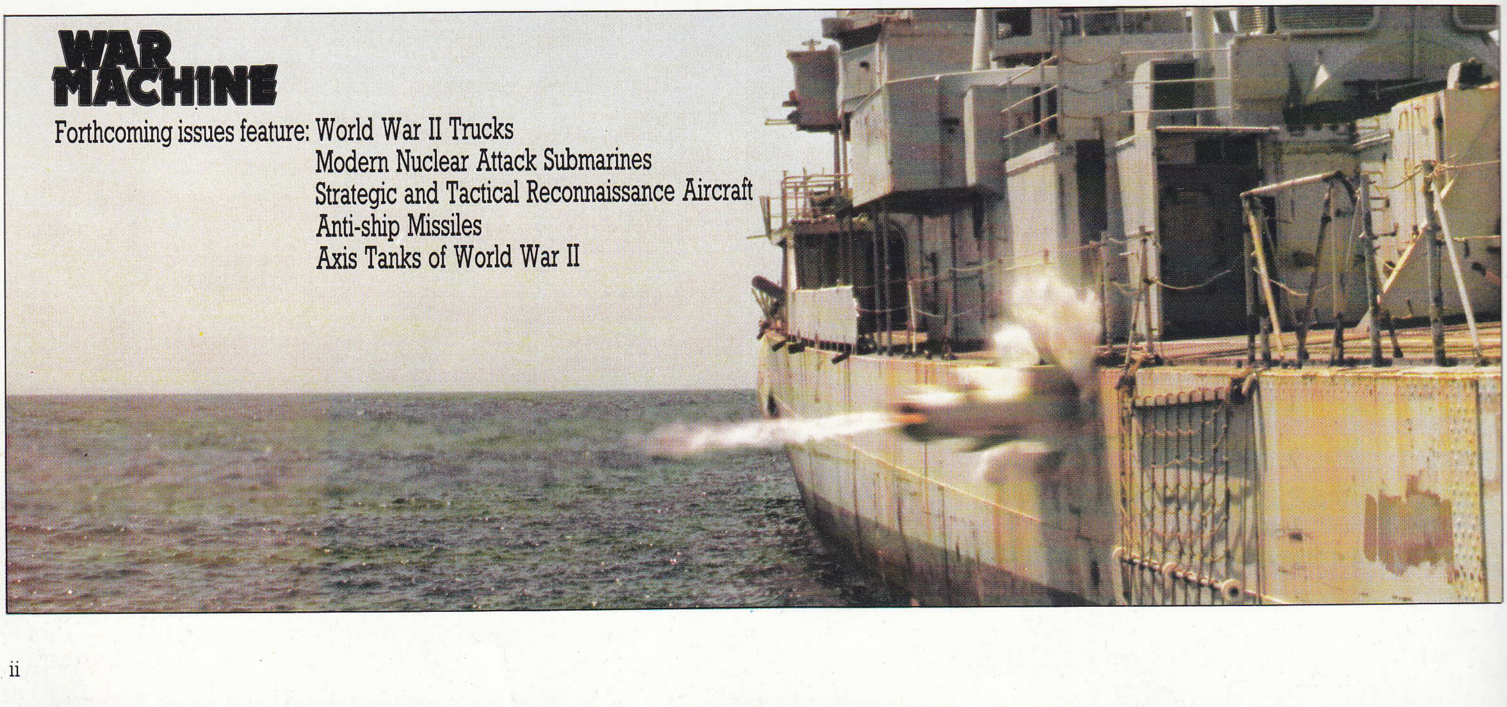


Modern Aircraft Carriers

The aircraft-carrier has developed rapidly since World War II. Extremely expensive but flexible in operation, the carrier has become the most visible sign of power projection throughout the world, from the Falklands to the Lebanon and Grenada.

The first of Britain's ASW carriers heads an ASW task group. At the bow can be seen the twin area defence Sea Dart SAM launcher, together with the white dome of the newly-installed Phalanx 20-mm close-in weapon system.

Since World War II the aircraft-carrier has evolved from a relatively simple 'carrier of aircraft' into a highly complex and integrated weapons system which has the potential to fight and survive in nuclear war as well as constituting an especially important political tool in the field of world politics. Such carriers (as part of carrier battle groups) are regularly used by the United States as political and military fire brigade units, moved to high-tension areas which are of politico-economic interest to the USA. The most recent examples of this policy are the deployments off both the Pacific and Atlantic coasts of Nicaragua, off the Lebanon, outside the Persian Gulf and in the Caribbean off Grenada.

It is fortunate that most NATO countries find the cost of building and operating fixed-wing conventional aircraft-carriers to be prohibitive and have consequently withdrawn the few that they had from use. In the case of the United Kingdom such carriers were replaced by ships configured to carry the revolutionary V/STOL BAe Sea Harrier fighter. However, even though these ships performed magnificently during the Falklands war the aircraft they carry are limited in operational capabilities and numbers. It must be said that had there been present a fixed-wing carrier with an air group of McDonnell Douglas Phantoms, BAe Buccaneers and Fairey Gannet AEW aircraft in addition to Sea Harriers, then the defensive air war and counter-air operations against Port Stanley airport would have been considerably more successful than they were and the actual number of Royal Navy warships and auxiliaries lost or damaged would have been lower. The main point is that although V/STOL aircraft do provide a significant improvement (in terms of operational constraints removed from the the carrier during flight operations), it should have been realized in the relevant defence and political circles that such a combination is in fact complementary to the conventional carrier and not a replacement for it. For instance, the presence of the long-range Phantom and Buccaneer would have created serious defence problems for the Argentinian high command as these aircraft would easily have been capable of attacking the Argentinian air bases from which the strikes against the task force were launched, something which the Sea Harriers would have found very difficult to do. In addition the Buccaneers with a suitable anti-ship missile would have created an Exocet-type threat in reverse to the Argentinian navy, whilst the presence of airborne early warning and fighter-control aircraft would have resulted in a much more effective air defence for the task force. It is interesting to note that the US Navy has already conducted successful trials with US Marine Corps AV-8s as part of an air group with fixed-wing aircraft, whilst it will probably be the Soviets who will actually operate both carrier types within a single carrier group when their first nuclear-powered fixed-wing carrier is commissioned in the late 1980s. They already operate VTOL-equipped ships in the form of their hybrid cruiser-carrier 'Kiev' class.

For those smaller countries that still have carriers in service the current choice has mostly been to refit them to last until the 1990s while studying long-term replacement plans. Only France has committed itself to fixed-wing operations into the 21st century by planning two nuclear-powered replacements for the 'Clemenceau' class, whilst Spain and India have leaned towards V/STOL aircraft. In the case of the largest operator, the USA, heavy investment in nuclear-powered vessels has resulted in the fixed-wing option with any suggestion of V/STOL carriers quickly discarded on the grounds of such carriers' lack of multi-role capability. The US Marine Corps thus remains the major operator of V/STOL aircraft in that country.

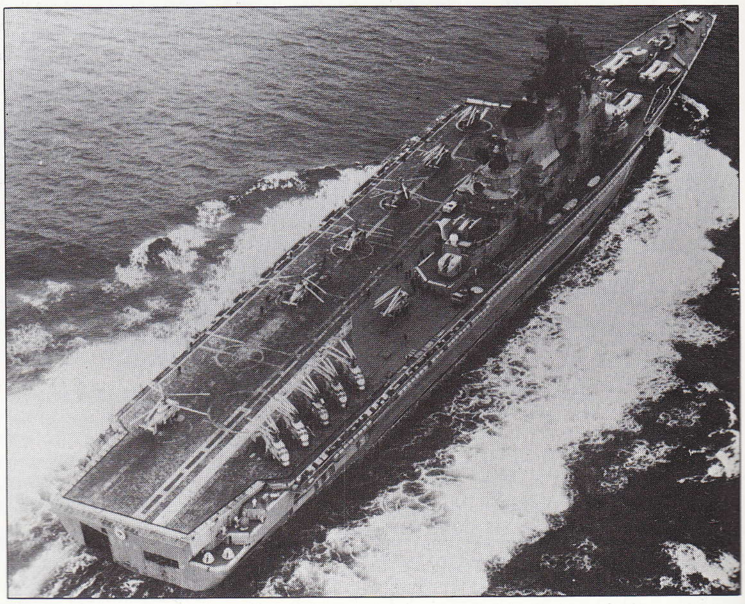
An increasingly common sight on the world's oceans, this Soviet carrier group includes Kiev, a 'Kresta' class ASW cruiser, a 'Kashin' class SAM destroyer, and a fast support vessel.

USSR

'Kiev' class

Planning for a class of hybrid cruiser-carriers probably started in the Soviet Union in the early 1960s, when the need was seen for a small number of ships suitable for carrying interceptor aircraft capable of providing the air defence necessary for Soviet submarine-hunting forces and submarines operating in hostile sea areas. Although the 'Moskva' class of helicopter-cruisers was meant to be in series production, with a total of 12 planned, the units of the class could operate only ASW helicopters, and so did not meet the new requirement. Thus the yard building the 'Moskva' class, Black Sea Shipyard No. 444 at Nikolayev, was switched to building the new design after only two 'Moskva' class ships had been completed. The first of the new four-ship class, the ***Kiev***, was laid down in September 1970, launched in December 1972 and commissioned in October 1976 after extensive trials. The second ship, the ***Minsk***, followed in December 1972, was launched in August 1975 and commissioned in July 1979. The third ship, the ***Novorossiysk*** (to a modified design) was laid down in September 1975, launched in December 1978 and entered service in June 1983. The final vessel, the ***Kharkov***, was laid down in January 1979, launched in April 1982 and will enter service in 1985. Already a nuclear-powered conventional fixed-wing carrier is being laid down to follow on from the 'Kiev' class. This vessel is due to be in service by 1988.

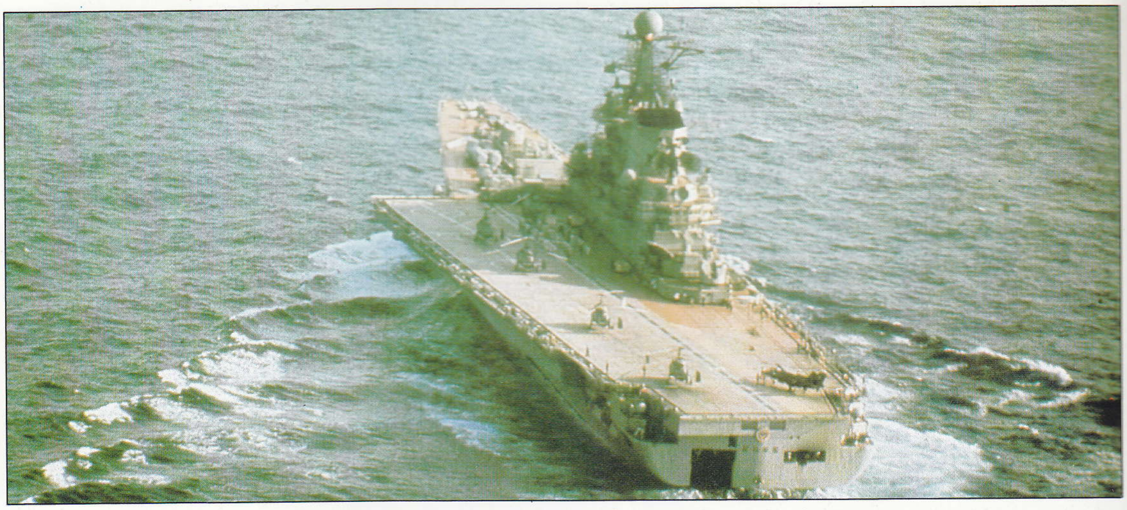
The *Kiev* and her sisterships are basically the same in physical appearance but differ in equipment fits. All have seven take-off and landing spots marked on their angled flightdecks on the port side: six (marked with the letter C and the numbers 1 to 6) are for helicopters, whilst the Yakovlev Yak-36MP 'Forger-A' VTOL fighters take off from position 6 and land on the 189-m (620-ft) long, 20.7-m (68-ft) wide asbestos tile-coated flightdeck near position 5 on a specially designated spot, marked with an E on the *Kiev* and an M on the *Minsk* and *Novorossiysk*. Each of the first two ships have seven deck lifts, a 7-m (23-ft) square unit for cargo on the port side of the island forward, a 19.2 m (63 ft) by 10.35 m (34 ft) unit for helicopters close to the island midpoint, an 18.5 m (60 ft 8 in) by 4.7 m (15 ft 5 in) unit aft of the island for the 'Forgers', three 6.5 m (21 ft 4 in) by 1.5 m (5 ft) weapons lifts in line astern next to the helicopter lift, and a similarly-sized personnel lift on the port side. The third ship does not have the cargo lift and has only two ammunition lifts. In addition she has a test area for running up the 'Forger' engines on the starboard side of the flight deck. The air wing for the 'Kiev' class comprises 12 Yak-36s (including one 'Forger-B' unarmed conversion trainer), 18 Kamov Ka-25 'Hormone-A' ASW helicopters, three 'Hormone-B' midcourse missile-guidance correction/target designator/ELINT helicopters and one 'Hormone-C' SAR plane-guard helicopter. The *Novorossiysk* has also been seen with a number of Kamov Ka-27 'Helix-A' ASW helicopters for carrier evaluation trials. All the embarked aircraft can be carried in the hangar. The *Novorossiysk* is fitted with space for the new SA-N-8 SAM vertical launch system in place of the SA-N-4 'Gecko' bin launchers carried by her sisters. On the electronics side the *Novorossiysk* does not carry the characteristic 'Side Globe' ESM domes on each side of the island superstructure, but has instead two as yet unidentified radars and four 'Bell Crown' electro-optical targeting systems that were first seen on the nuclear-powered battle-cruiser *Kirov*. According to current thought it is believed that there will be two 'Kievs' each with the Pacific and Northern Fleets for surface action/ASW group command and control roles, with at least one operating with her escort group on an out-of-the area politico-military mission at any one time. The 'Kievs' carry nuclear-armed SS-N-12s, FRAS-1s and depth bombs in their magazines.



Kiev *seen during a Soviet Fleet exercise in 1978 south of Iceland. Four Kamov Ka-25 'Hormone' helicopters are ready for flight, with another eight on deck with rotors folded. Used primarily for ASW, they carry a surface search radar, dunking sonar, sonobuoys and ASW weapons.*

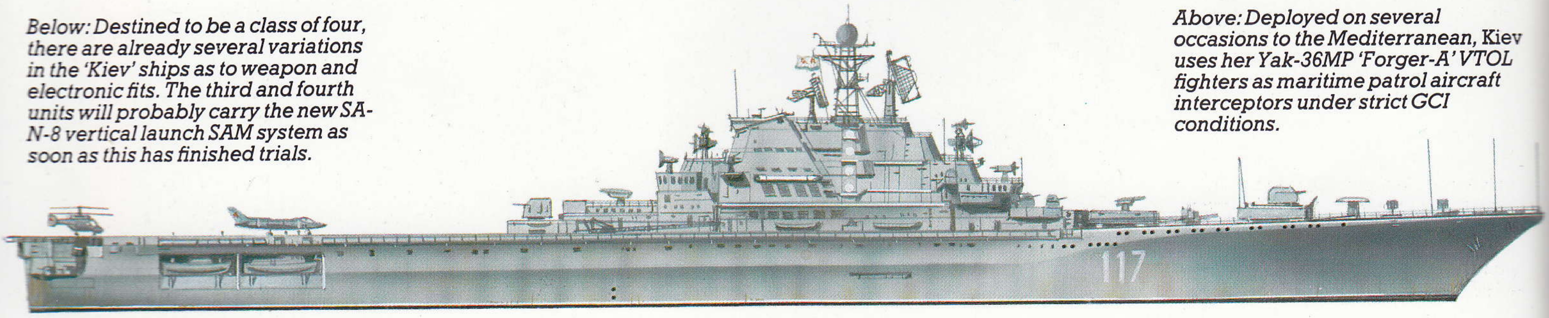
Specification

Displacement: 36,000 tons standard, 44,000 tons full load
Dimensions: length 275 m (902 ft 3 in); beam 50 m (164 ft) including flightdeck and sponsons; draught (31 ft 2 in)
Machinery: four-shaft geared steam turbines delivering 180,000 shp (134225 kW)
Speed: 32 kts
Armament: four twin SS-N-12 'Sandbox' SSM launchers (16 missiles), two twin SA-N-3 'Goblet' area-defence SAM launchers (72 missiles), two twin SA-N-4 'Gecko' short-range SAM launchers (36 missiles, not in third vessel), two twin 76-mm (3-in) DP, eight 30-mm ADG-630 six-barrel 'Gatling' CIWS, two 12-barrel 250-mm (9.84-in) MBU 600 ASW rocket-launchers, one twin SUW-N-1 ASW launcher (20 FRAS-1 and SS-N-14 'Silex' carried) and two quintuple 533-mm (21-in) ASW torpedo tubes
Electronics: one 'Top Knot' TACAN system, one 'Top Sail' and one 'Top Steer' 3D radar, one 'Don Kay' and two 'Palm Frond' navigation and surface-search radars (three 'Palm Frond' and two unidentified in *Novorossiysk*), one 'Bob Tail' and two 'Punch Bowl' satellite navigation systems, one 'Trap Door' SS-N-12 guidance radar, two 'Head Light' SA-N-3 guidance radars, two 'Pop Group' SA-N-4 guidance radars (not in third vessel), two 'Owl Screech' fire-control radars for 76-mm (3-in) guns, four 'Bass Tilt' fire-control radars for ADG-630 guns, most Soviet naval ESM systems including 'Side Globe', 'Rum Tub', 'Top Hat' and 'Bell' series, one low-frequency bow-array sonar, and one medium-frequency variable-depth towed sonar
Complement: 1,200 excluding air wing



Above: Deployed on several occasions to the Mediterranean, Kiev uses her Yak-36MP 'Forger-A' VTOL fighters as maritime patrol aircraft interceptors under strict GCI conditions.

Below: Destined to be a class of four, there are already several variations in the 'Kiev' ships as to weapon and electronic fits. The third and fourth units will probably carry the new SA-N-8 vertical launch SAM system as soon as this has finished trials.



INDIA

Vikrant

Formerly the British 'Glory' class carrier HMS *Hercules* that had been laid up in an incomplete state since May 1946, the ***Vikrant*** (as she was renamed) was purchased by India in January 1957, and taken in hand by the Belfast shipyard Harland & Wolff in April 1957 for completion with a single hangar, two electrically-operated aircraft lifts, an angled flight deck and steam catapult. She was also partially fitted with an air conditioning system for tropical service, and commissioned in March 1961. During the 1971 Indo-Pakistan War the *Vikrant* operated a mixed air group of 16 Hawker/Armstrong Whitworth Sea Hawk fighter-bombers and four Breguet Alizé ASW aircraft off East Pakistan (now called Bangladesh), the elderly Sea Hawks attacking many coastal ports, airfields and small craft in a successful operation to prevent the movement of Pakistani men and supplies during Indian army operations to 'liberate' that country. In January 1979 the *Vikrant* commenced a major refit that ended in January 1982 to enable her to operate BAe Sea Harrier FRS.Mk 1 aircraft. Included in the refit was the construction of a ski-jump ramp, the fitting of new boilers and engines, the provision of new Dutch radars and the fitting of a new operations control system. Interestingly enough, it is reported that the steam catapult has been retained in order that the carrier still operate the Alizé ASW aircraft, a number of which were refurbished at the same time for effective service up to the early 1990s. The new air group complement will probably consist of six to eight Sea Harriers, six to eight Alizés, six Westland Sea King Mk 42 ASW/anti-ship missile helicopters and one or two Aérospatiale Alouette III utility helicopters. Under present plans the Indian naval air arm is undergoing a major modernization and expansion programme, and studies are being made on *Vikrant*'s eventual replacement. A projected in-service date of the early to mid-1990s is assumed.

Specification

Displacement: 15,700 tons standard, 19,500 tons full load

Dimensions: length 213.4 m (700 ft); beam 24.4 m (80 ft); draught 7.3 m (24 ft); flightdeck width 39.0 m (128 ft)

Machinery: two-shaft geared steam turbines delivering 40,000 shp (29,830 kW)

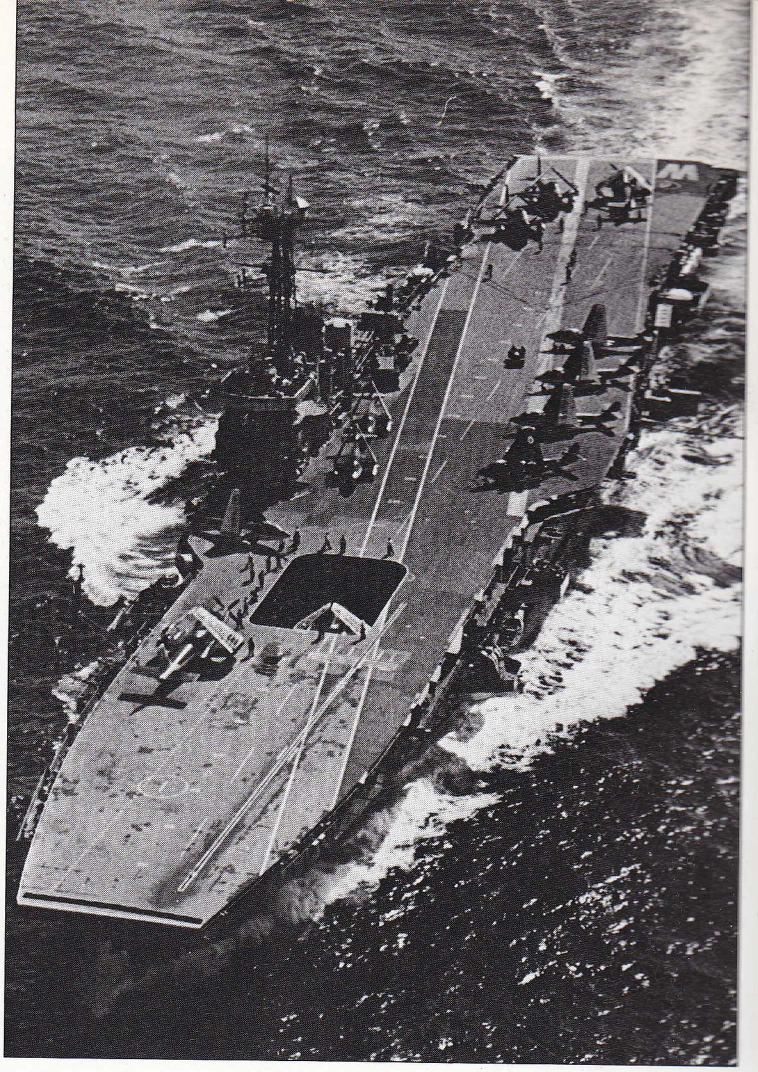
Speed: 24.5 kts

Armament: nine single 40-mm AA

Aircraft: see text

Electronics: one LW-05 air-search radar, one ZW-06 surface-search radar, one LW-10 tactical search radar, one LW-11 tactical search radar, one Type 963 carrier controlled approach radar

Complement: 1,075 (including air group) in peace, 1,345 (including air group) in war



Used extensively in the 1971 Indo-Pakistan war, INS* Vikrant *was the major Indian Navy unit responsible for the blockade of East Pakistan. Her air group of Breguet Alizé ASW aircraft and Sea Hawk fighter-bombers sank a number of Pakistani naval and merchant craft.

USA

'Hancock' and 'Intrepid' class

Originally part of the six-strong 'Essex' class these two sub-classes were extensively modernized in the 1950s with enclosed bows, armoured and angled flightdeck, improved aircraft elevators, increased aircraft fuel stowage and new steam catapults. Now down to three in number (the USS *Lexington*, USS *Bonne Homme Richard* and USS *Oriskany*, commissioned respectively in February 1943, November 1944 and September 1950), the two classes have only one of their number, the *Lexington*, in active service with the Atlantic Fleet as the US Navy's sole deck landing training carrier. As such the *Lexington* has no aircraft-support facilities aboard. The other two ships are laid up with the Pacific Fleet reserve and are expected to be deleted before long, although in 1981 the *Oriskany* was the object of a reactivation plan along the lines of the 'New Jersey' class battleships. But because of severe limitations in the types of aircraft she can carry (such as the Vought F-8 Crusader and McDonnell Douglas A-4 Skyhawk), her ordnance load and her fuel stowage, this was vetoed by the US Congress. Under current plans the *Lexington* will run on to the late 1980s in the training role with the possibility that she may be replaced by the *Coral Sea* when that ship is phased out of front-line service. The actual aviation ordnance load is believed to be in the order of 750 tons, and that of aviation fuel about 1.135 million litres (300,000 US gal).

Specification

'Hancock' and 'Intrepid' classes

Displacement: (first two) 29,660 tons standard, 41,900 tons full load; (third) 28,200 tons standard, 40,600 tons full load

Dimensions: length (first) 270.9 m (889 ft) and (other two) 274 m (899 ft); beam (first two) 31.4 m (103 ft) and (third) 32.5 m (106 ft 6 in); draught 9.5 m (31 ft); flightdeck width (first) 58.5 m (192 ft), (second) 52.4 m (172 ft) and (third) 59.5 m (195 ft)

Machinery: four-shaft geared steam turbines delivering 150,000 shp (111855 kW)

Speed: 29.1 kts

Aircraft: 60-70 (none in *Lexington*)

Armament: two (*Oriskany*) or four (*Bonne Homme Richard*) 127-mm (5-in) DP

Electronics: one SPS-10 surface-search and navigation radar, one SPS-30 air-search radar (one SPS-12 in *Lexington*), one SPS-43A air-search radar (one SPS-37 in *Oriskany*), one SPN-10 and one SPN-43 aircraft landing aids, several Mk 25/35 fire-control radars (none in *Lexington*), one URN-20 TACAN system

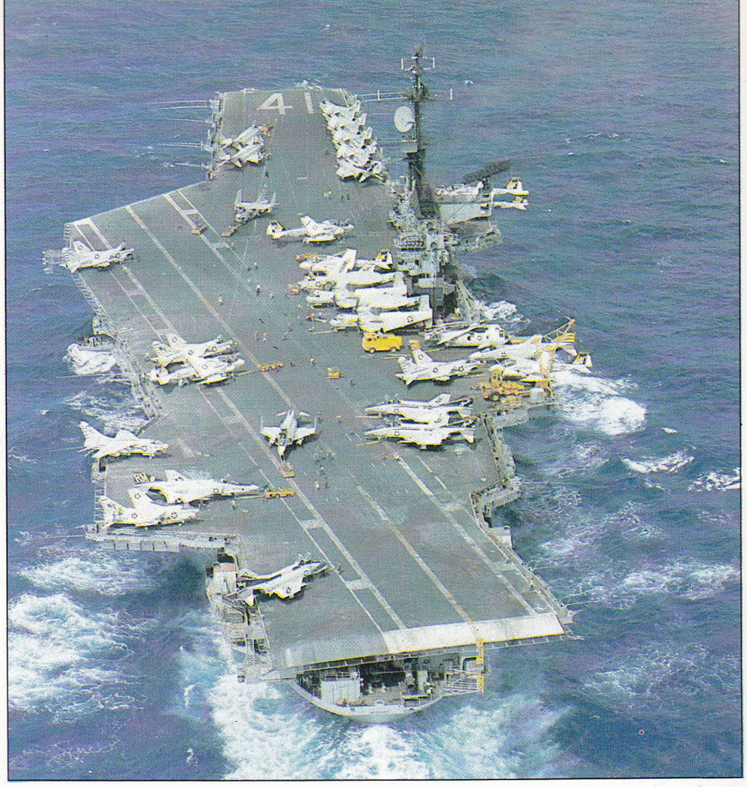
Complement: 2,090 plus 1,185 air group (*Lexington* 1,440)

Now stricken from service, USS* Intrepid *served as an ASW carrier during her later years. Her only active sister is USS* Lexington*, serving as a training carrier into the late 1980s.

USA

'Midway' class

Originally two of a class of three, the USS ***Midway*** and USS ***Coral Sea*** (commissioned in September 1945 and October 1947) were the largest US carriers to be constructed during World War II and the only ones capable, in unmodified form, of operating the post-war generation of heavy nuclear-armed attack aircraft. All three eventully underwent modernization programmes which, because they occurred over a long time span, differed considerably in detail. Only the *Midway* and *Coral Sea* remain in service, the former being attached to the Pacific Fleet and homeported in Yokosuka, Japan, and the latter serving as a front-line carrier on the strength of the Atlantic Fleet with reduced air groups from carriers that are in refit. The third vessel, the USS *Franklin D. Roosevelt*, was struck off in 1977, her name subsequently being assigned to a new 'Nimitz' class carrier. Because of their smaller size the 'Midway' class carry the McDonnell Douglas F4N/S Phantom in place of the Grumman F-14A Tomcat, and do not embark the Lockheed S-3A Viking or Sikorsky SH-3 Sea King helicopter. Both ships are fitted with three deck-edge aircraft elevators, but while the *Midway* has only two steam catapults the *Coral Sea* has three. A total of 1,210 tons of aviation ordnance and 4.49 million litres (1.186 million US gal) of JP5 aircraft fuel are carried for the air wing. Of the two ships the *Midway* is the more capable as she underwent an extensive refit in 1966, but both ships will be phased out by the late 1980s, the *Coral Sea* in 1988 and the *Midway* in the following year.

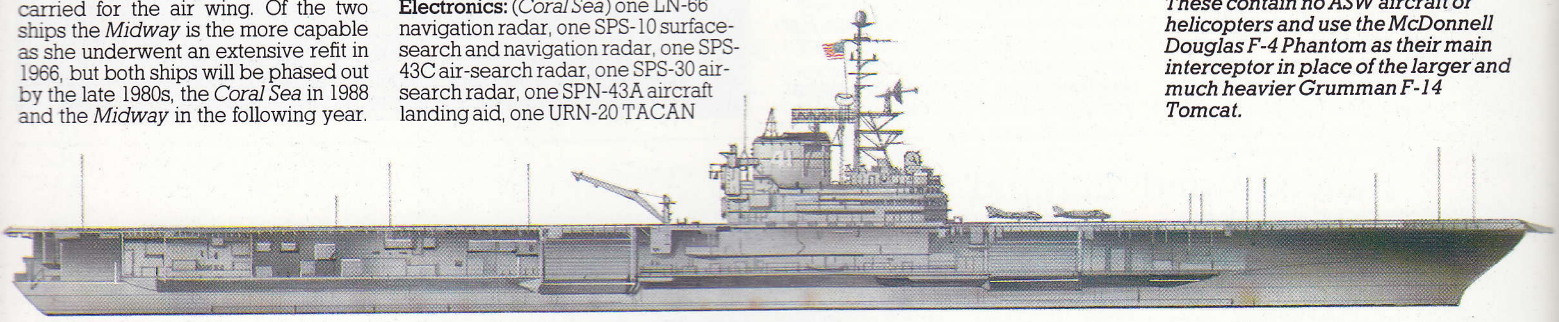


A stern view of USS* Midway*, considered to be the more capable of the two 'Midway' class vessels left in service. It is planned that she will be run on until 1989 as a front-line carrier whilst her sister, USS* Coral Sea*, will be phased out in 1988.

Specification

Displacement: *Midway* 51,000 tons standard, 64,000 tons full load; *Coral Sea* 52,500 tons standard, 63,800 tons full load
Dimensions: length 298.4 m (979 ft); beam 36.9 m (121 ft); draught 10.8 m (35.3 ft); flightdeck width 72.5 m (238 ft)
Machinery: four-shaft geared steam turbines delivering 212,000 shp (158090 kW)
Speed: 30.6 kts
Aircraft: see text
Armament: two octuple Sea Sparrow SAM launchers (no reloads) in *Midway* only, three 20-mm Phalanx CIWS in both
Electronics: (*Midway*) one LN-66 navigation radar, one SPS-65V air/surface-search radar, one SPS-43C air-search radar, one SPS-49 air-search radar, one SPS-48C 3D radar, one SPN035A, two SPN-42 and one SPN-44 aircraft landing aids, two Mk 115 fire-control radars, one URN-29 TACAN system, one SLQ-29 ESM suite, four Mk 36 Super RBOC chaff launchers
Electronics: (*Coral Sea*) one LN-66 navigation radar, one SPS-10 surface-search and navigation radar, one SPS-43C air-search radar, one SPS-30 air-search radar, one SPN-43A aircraft landing aid, one URN-20 TACAN system, one SLQ-29 ESM suite, four Mk 36 Super RBOC chaff launchers
Complement: *Midway* 2,615 plus 1,800 air group; *Coral Sea* 2,710 plus 1,800 air group

Below: Because of their smaller size, the two 'Midway' class ships have to operate with reduced air groups. These contain no ASW aircraft or helicopters and use the McDonnell Douglas F-4 Phantom as their main interceptor in place of the larger and much heavier Grumman F-14 Tomcat.



USA

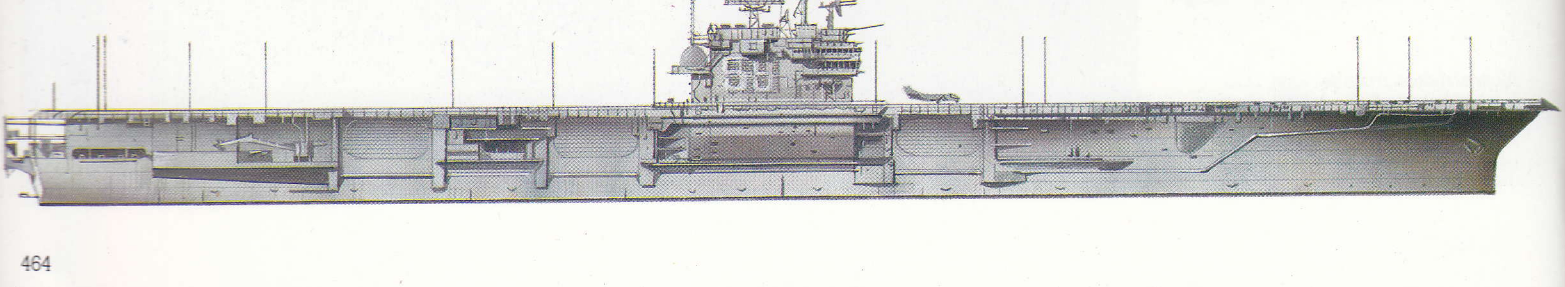
'Forrestal' class

The four ships of the 'Forrestal' class were originally conceived as smaller versions of the ill-fated strategic carrier design, the USS *United States*, with four aircraft catapults and a flush flightdeck with no island. However, following a complete redesign they were actually completed as the first carriers designed and built specifically for jet aircraft operations with a conventional island and an angled flight deck to allow the four catapults to be retained. The ships are the USS ***Forrestal***, USS ***Saratoga***, USS ***Ranger*** and USS ***Independence***, and were commissioned in October 1955, April 1956, August 1957 and January 1959 respectively. Their aviation ordnance load is 1,650 tons; and 2.84 million litres (750,000 US gal) of AVGAS aviation fuel, 2.99 million litres (789,000 US gal) of JP5 aviation fuel are carried for the air wing embarked. The air group is similar to those of the larger carriers, but McDonnell Douglas F-4N6S Phantoms are carried in place of Grumman F-14A Tomcats. The ships have the standard four aircraft elevators to service the flightdeck, and are due to undergo the SLEP refit (in the order *Saratoga, Forrestal, Independence* and *Ranger*) to extend their service lives up to around the year 2000. During the Grenada landings of November 1983 *Constellation* provided the air cover and strike support to the US Marine Corps and US Army Ranger assaults whilst maintaining ASW cover against any possible incursions by the two Cuban 'Foxtrot' class conventional attack submarines. In order to rectify some of the deficiencies encountered in combat operations, the SLEP refits will improve the habitability, add Kevlar armour to enclose the vital machinery and electronics spaces, improve the NTDS fitted, add TFCC facility and replace the catapults. The radar outfit will also be upgraded and the air-defence armament strengthened with the addition of the Phalanx 'Gatling' gun for anti-missile use. At present the *Forrestal* is the carrier under SLEP modernization, whilst the *Saratoga* will recommission into the Atlantic Fleet to serve alongside the *Independence*. The *Ranger* is in service with the Pacific Fleet.

Specification

Displacement: (first two) 59,060 tons standard, 75,900 tons full load; (second two) 60,000 tons standard, 79,300 tons full load

Forming a class of four, the 'Forrestal' ships will soon have their F-4 Phantoms exchanged for the more capable F-14 Tomcat. They will also operate the new F-18A Hornet multi-role fighter.



Dimensions: length (first) 331 m (1,086 ft), (second) 324 m (1,063 ft), (third) 326.4 m (1,071 ft) and (fourth) 326.1 m (1,070 ft); beam 39.5 m (129 ft 6 in); draught 11.3 m (37 ft); flightdeck width 76.8 m (252 ft)
Machinery: four-shaft geared steam turbines delivering 260,000 shp (193880 kW) in *Forrestal* and 280,000 shp (208795 kW) in others
Speed: 33 kts (*Forrestal*) or 34 kts (others)
Aircraft: as for 'Nimitz' class but Phantoms instead of Tomcats
Armament: three octuple Sea Sparrow SAM launchers (no reloads), three 20-mm Phalanx CIWS
Electronics: one LN-66 navigation radar, one SPS-10 surface-search radar, one SPS-48C 3D radar, one SPS-58 low-level air-search (except *Ranger*), two SPN-42 and one SPN-43A aircraft landing aids, two Mk 91 fire-control radars (three in first two), one URN-20 TACAN system, one SLQ-29 ESM suite and three Mk 36 Super RBOC chaff launchers
Complement: 2,790 plus 2,150 air group

Seen here in 1975, USS Independence *was used to provide the air cover for the Grenada landings. She has also seen extensive combat service in the Vietnam war off both the North and South coasts.*

The US Carrier Battle Groups

The US Navy allocates its main strike potential to a number of Carrier Battle Groups (CBG), each of which comprises a single multi-mission aircraft-carrier (with composite interceptor/strike/ASW air wings) and a six-ship escort. The latter generally consists of one or two Standard ER missile-equipped cruisers, one Standard MR missile-equipped destroyer and two or three 'Spruance' class ASW destroyers and/or 'Knox' class ASW frigates. If the carrier is nuclear-powered then the cruisers will also be nuclear-powered wherever possible.

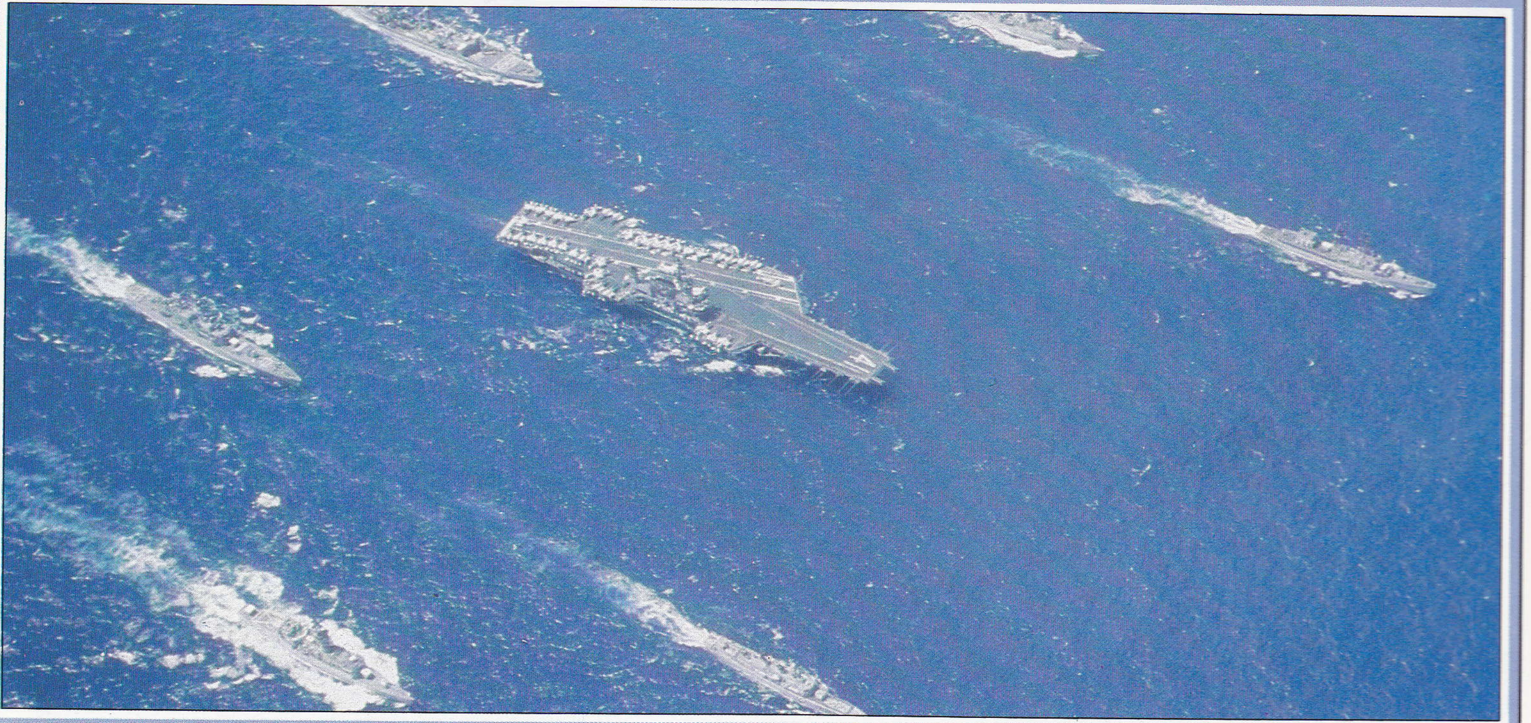
In late 1983 there are 14 front-line carriers available, of which one is assigned to the Service Life Extension Program (SLEP) at any time. The 14 vessels consist of 12 post-war construction (including four nuclear-powered) and two modified World War II-built carriers; two nuclear-powered replacements for the two 'Midway' class carriers have been ordered. There is also a 15th carrier, an obsolete ship which is being run on till the late 1980s solely as a carrier deck landing training ship and as such has no combat capability.

Thus the effective operational strength of the US fleet is 13 carriers, which is a sufficient number to provide for a minimum of four carrier battle groups to be deployed in forward areas on a continuous basis whilst the remaining nine are in short-period overhaul, on working up exercises or in transit to and from the operational areas. The Pacific Fleet operates four CBGs with its 3rd Fleet and two with its 7th Fleet in the operational North West Pacific and South East Asia areas. One of the carrier battle groups attached to the 7th Fleet is deployed to the Indian Ocean on a regular basis. In the Atlantic Fleet area of operations the US 2nd Fleet has four CBGs available whilst the strategically important 6th Fleet in the Mediterranean has two. Again one of these is occasionally deployed to the Indian Ocean.

The basic role of the CBG is to provide for its parent fleet both offensive power projection and defensive sea control capabilities in its area of responsibility. For this the embarked carrier air wing has available a wide variety of aviation ordnance to meet most conventional and nuclear war requirements. It is not widely known that for the latter contingency each carrier includes in its weapon inventory over 100 nuclear gravity bombs of the B43, B57 and B61 types (with yields varying from 5 kt up to 900 kt) and nuclear-armed Walleye air-to-surface missiles (with 100-kt yield warheads). To deliver these and other weapons the carrier has available 34 Vought A-7 Corsair and Grumman A-6 Intruder aircraft for strike missions and 16 Lockheed S-3A Viking aircraft and Sikorsky SH-3H Sea King helicopters for anti-submarine operations. Of these the most deadly are the 10 Intruders, which are proven and very accurate all-weather day and night attack aircraft. The presence of a limited number of air-laid ground mines within the weapons load also allows the possibility of a blockade to become part of the carrier's offensive options.

In addition to the CBG, an Underway Replenishment Group (URG) has to be formed to support it with food, fuel, spares, ammunition and other sundry items. The oiler attached to this URG normally carries enough fuel to replenish the entire CBG twice over before it has itself to be refuelled. It is this component of the CBG concept which is the most vulnerable because if an enemy can detect and destroy the URG either before or during an operation then the CBG runs the risk of running out of the supplies essential to its operations and will not be able to complete its assigned mission.

A US Carrier Battle Group in the Indian Ocean centred on USS Midway, *also showing USS* Bainbridge, *a missile cruiser, and the oiler* Navasota.



USA

'Kitty Hawk', 'America' and 'John F. Kennedy' classes

Built to an improved 'Forrestal' class design, these four carriers in reality constitute three sub-classes that are easily distinguished from their predecessors by the fact that their island superstructures are set farther aft. In addition two of their four aircraft elevators are forward of the island, the 'Forrestals' having only one in this location. A lattice radar mast is also carried abaft of the island. The USS ***America*** (commissioned in January 1965) is very similar to the first two ships (USS ***Kitty Hawk*** and USS ***Constellation***, commissioned in April 1961 and October 1961), and was built in preference to an austere-version nuclear-powered carrier. She is, however, the only US carrier of post-war construction to be fitted with a sonar system. The last unit, the USS ***John F. Kennedy***, was built to a revised design incorporating an underwater protection system developed originally for the nuclear carrier programme, and was commissioned in September 1968. All have four steam catapults and carry some 2,150 tons of aviation ordnance plus about 7.38 million litres (1.95 million US gal) of aviation fuel for their air groups. These are again similar in size and composition to those of the 'Nimitz' class. The tactical reconnaissance element in each of the air wings is provided by three Grumman F-14s equipped with a TARPS reconnaissance pod. Both these aircraft and the Vought A-7 Corsairs will eventually be replaced by the McDonnell Douglas F/A-18A Hornet multi-role fighter and strike aircraft. The ships are already fitted with or will shortly have the full ASCAC, NTDS and TFCC facilities, the *America* being the first carrier to be fitted the NTDS. The ships have the OE-82 satellite communications system, and were the first carriers able simultaneously to launch and recover aircraft easily; on previous carrier classes this was considered a difficult operation. Their SLEP refits are due from 1985 onwards to extend their lives into the 21st century. The first two units serve in the Pacific with the other two in the Atlantic.

Specification

'Kitty Hawk', 'America' and 'John F. Kennedy' classes

Displacement: first two 60,100 tons standard, 80,800 tons full load; third 60,300 tons standard, 81,500 tons full load; fourth 61,000 tons standard, 82,561 tons full load

Dimensions: length (first two) 318.8 m (1,046 ft), (third) 319.3 m (1,047 ft 6 in) and (fourth) 320.7 m (1,052 ft); beam 39.6 m (130 ft); draught (first three) 11.3 m (37 ft) or (fourth) 10.9 m (35 ft 11 in)

Machinery: four-shaft geared steam turbines delivering 280,000 shp (208795 kW)

Speed: 33.6 kts

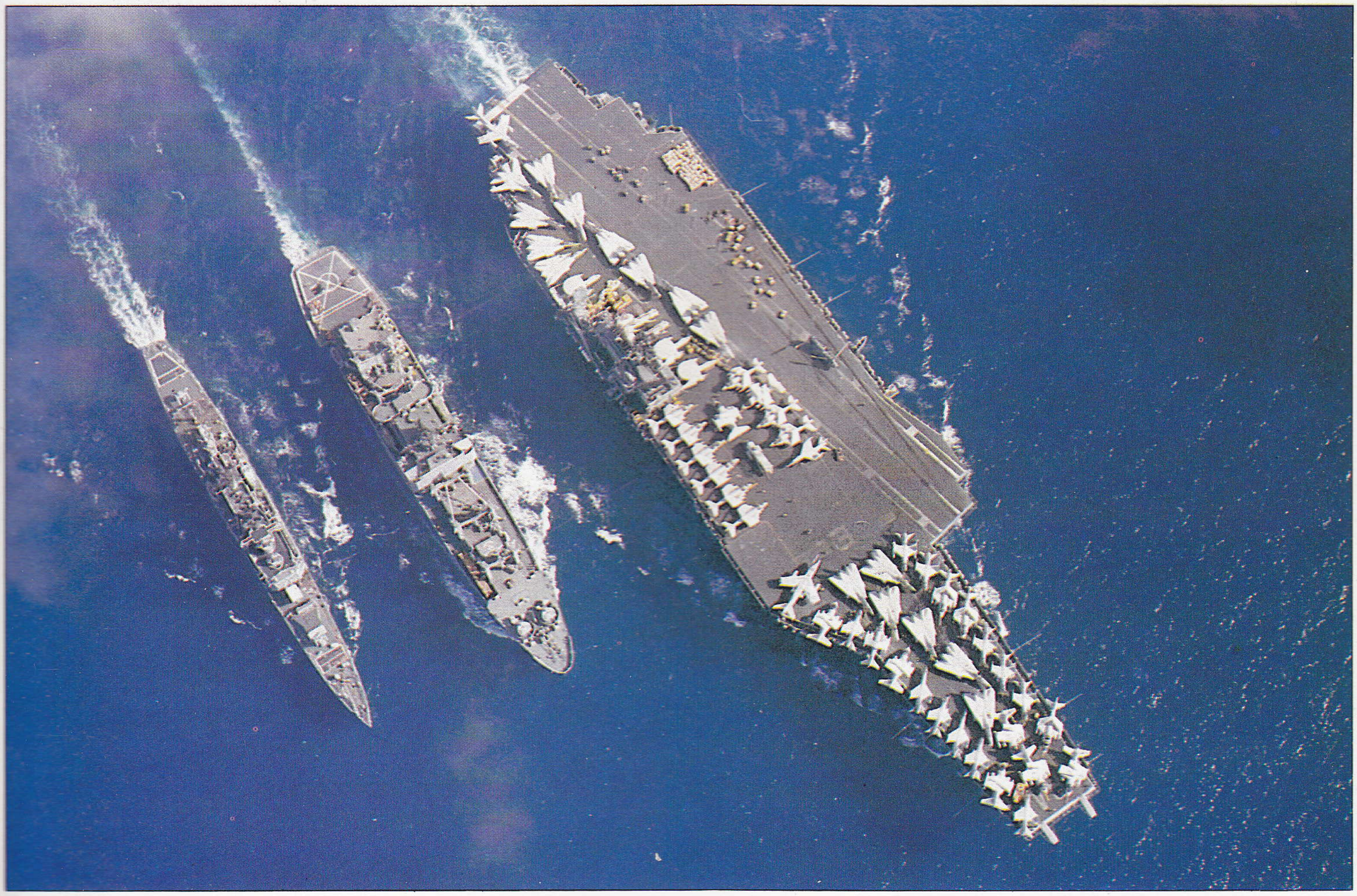
Aircraft: see 'Nimitz' class

Armament: three octuple Sea Sparrow SAM launchers (no reloads), three 20-mm Phalanx CIWS

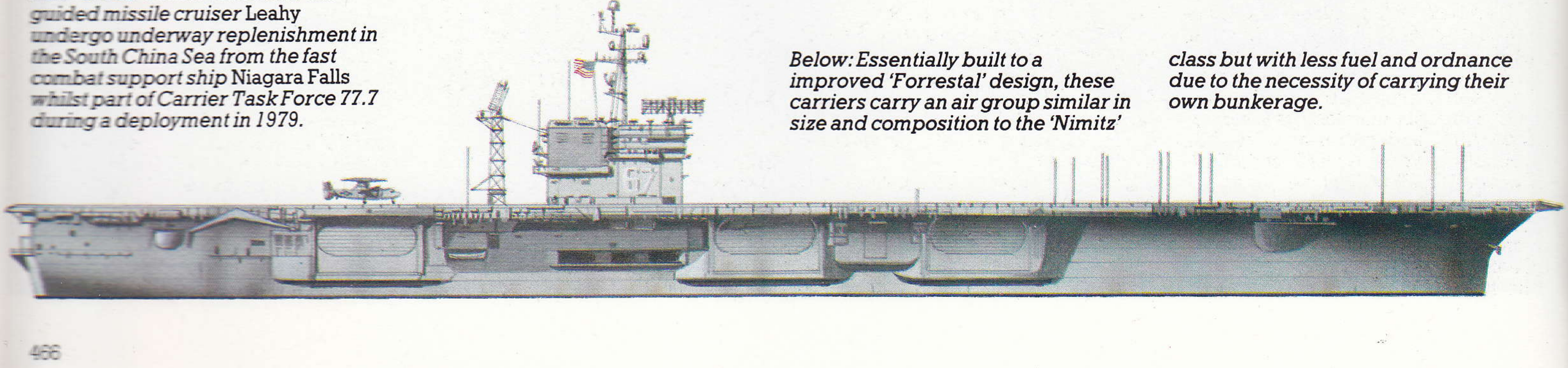
Electronics: (first three) one SPS-10F navigation radar, one SPS-43A air-search radar, one SPS-48C 3D radar, one SPN-35A, two SPN-42 and one SPN-43A aircraft landing aids, one URN-20 TACAN system, three Mk 91 fire-control radars, one SLQ-29 ESM suite, four Mk 36 Super RBOC chaff launchers (*America* only), one SQS-23 sonar

Electronics: (fourth) one SPS-10F navigation radar, one SPS-49 air-search radar, one SPS-48C 3D radar, one SPN-35A and two SPN-42 aircraft landing aids, one URN-20 TACAN system, three Mk 91 fire-control radars, one SLQ-29 ESM suite, four Mk 36 Super RBOC chaff launchers, fitted for but not with sonar

Complement: 2,900 plus 2,500 air group



Above: USS Constellation *and the guided missile cruiser* Leahy *undergo underway replenishment in the South China Sea from the fast combat support ship* Niagara Falls *whilst part of Carrier Task Force 77.7 during a deployment in 1979.*



Below: Essentially built to a improved 'Forrestal' design, these carriers carry an air group similar in size and composition to the 'Nimitz' class but with less fuel and ordnance due to the necessity of carrying their own bunkerage.

USA

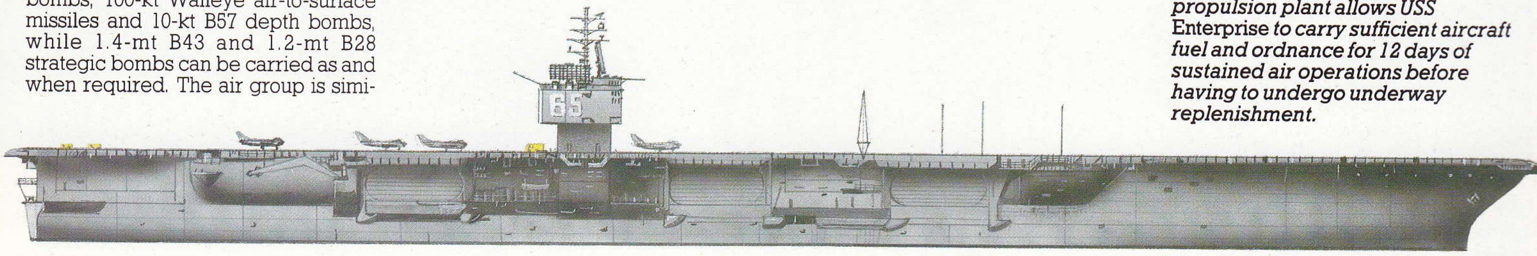
Enterprise

The world's first nuclear-powered aircraft-carrier, the **Enterprise** was laid down in 1958 and commissioned in November 1961 as what was then the largest warship ever built. Since exceeded in size by the 'Nimitz' class ships, the *Enterprise* was built to a modified 'Forrestal' class design with her larger dimensions dictated by the powerplant of eight A2W pressurized-water enriched uranium fuelled nuclear reactors. The high cost of her construction prevented five other vessels in the naval building programme from being built. From January 1979 to March 1982 the *Enterprise* underwent an extensive refit which included the rebuilding of her island superstructure and the fitting of new radar systems and mast to replace the characteristic ECM dome and billboard radar antenna that had been used since she was built. The *Enterprise* is equipped with four steam catapults, four deck-edge aircraft elevators and carries 2,520 tons of aviation ordnance plus 10.3 million litres (2.72 million US gal) of aircraft fuel, sufficient for 12 days of sustained air operations before replenishment. Like that of other US carriers the *Enterprise*'s ordnance includes 10-kt B61, 20-kt B57, 60-kt B43, 100-kt B61, 200-kt B43, 330-kt B61, 400-kt B43, 600-kt B43 and 900-kt B61 tactical nuclear gravity bombs, 100-kt Walleye air-to-surface missiles and 10-kt B57 depth bombs, while 1.4-mt B43 and 1.2-mt B28 strategic bombs can be carried as and when required. The air group is similar in size and configuration to that carried by the 'Nimitz' class carriers, and the *Enterprise* is fitted with the same ASCAC, NTDS and Tactical Flag Command Center (TFCC) facilities. In addition to her OE-82 satellite system she also carries two British SCOT satellite communications antenna units for use with British fleet units and NATO. These two systems were fitted in 1976. The *Enterprise* is currently deployed with the Pacific Fleet and is due for her SLEP refit between 1993 and 1995. It is estimated that she will be eventually paid off in about 2010.

The first nuclear-powered aircraft carrier, USS* Enterprise*, is seen here on sea trials after the major drydocking that included the rebuilding of her island superstructure and the replacement of her old ECM and radar systems.

Specification

Displacement: 75,700 tons standard, 89,600 tons full load
Dimensions: length 335.9 m (1,102 ft); beam 40.5 m (133 ft); draught 10.9 m (35 ft 9 in); flightdeck width 76.8 m (252 ft)
Machinery: four-shaft geared steam turbines (eight A2W nuclear reactors) delivering 280,000 shp (208795 kW)
Speed: 32 kts
Aircraft: see 'Nimitz' class
Armament: three octuple Sea Sparrow SAM launchers (no reloads), three 20-mm Phalanx CIWS
Electronics: one SPS-48C 3D radar, one SPS-49 air-search radar, one SPS-65 air/surface-search radar, one SPS-58 low-level air-search radar, one SPS-10 surface-search and navigation radar, one SPN-41, one SPN-35A and one SPN-44 aircraft landing aids, one URN-26 TACAN system, three Mk 91 fire-control radars, one SLQ-29 ESM suite, four Mk 36 Super RBOC chaff launchers
Complement: 3,395 plus 1,891 air group



The use of nuclear power as the propulsion plant allows USS* Enterprise *to carry sufficient aircraft fuel and ordnance for 12 days of sustained air operations before having to undergo underway replenishment.

USA

'Nimitz' class

The first three 'Nimitz' class carriers were originally designed as replacements for the elderly 'Midway' class carriers. They differ from the earlier nuclear-powered USS *Enterprise* in having a new two-reactor powerplant design in two separate compartments with ordnance magazines between and forward of them. This increases the internal space available to allow some 2,570 tons of aviation weapons and 10.6 million litres (2.8 million US gal) of aircraft fuel to be carried. These totals are sufficient for 16 days of continuous flight operations before the stocks have to be replenished. The class is also fitted with the same torpedo protection arrangement as carried by the USS *John F. Kennedy*, and is laid out with the same general arrangement and electronic fit as the 'JFK'.

Under the present multi-mission designations of the USS carrier force the class is being fitted with an ASW Classification and Analysis Center (ASCAC) for data sharing of subsurface operations between the carrier, her escorts, their airborne ASW aircraft and supporting long-range maritime ASW and patrol aircraft. The ships also have the Naval Tactical Data System (NTDS) with intership and aircraft data links 11 and 14, and are fitted with the OE-82 satellite communications outfit. A Tactical Flag Command Center is also being fitted for use by the fleet command officers normally embarked. Four deck-edge aircraft elevators are available, two forward and one aft of the island on the starboard side and one aft on the port side. The hangar is 7.8 m (25 ft 7 in) high, and like those of other US carriers can accommodate at most only 40-50 per cent of the aircraft embarked at any one time, the remainder being spotted on the flightdeck in aircraft parks. The angled flight deck is 237.7 m (780 ft) long and is fitted with three arrester wires and an arrester net for recovering aircraft. Four steam catapults are carried, two on the bow launch position and two on the angled flightdeck. A typical 'Nimitz' class air group comprises two squadrons of Grumman F-14A interceptors, two squadrons of Vought A-7E Corsair light attack aircraft and one squadron of Grumman A-6E Intruder all-weather attack aircraft, plus Grumman KA-6D Intruder tankers, Grumman E-2C Hawkeye airborne early warning, Grumman EA-6B Prowler electronic countermeasures, Lockheed S-3A Viking ASW and Sikorsky SH-3H Sea King ASW units. There are also facilities for a Grumman C-2A Greyhound carrier on-board delivery aircraft.

In 1981 the first of at least three improved 'Nimitz' class carriers was ordered after much discussion both within the Congress and the Pentagon. These vessels will have Kevlar armour (being retrofitted in the other ships) over their vital areas and have improved hull protection arrangements in addition to those already fitted. The core life of the A4W reactors fitted is under normal usage expected to provide a cruising distance of some 1287440 to 1609300 km (800,000 to 1,000,000 miles) and last for 13 or so years before the cores have to be replaced. Although the class is relatively new, it is planned for the 'Nimitz' class to undergo Service Life Extension Program (SLEP) refits during the first decade of the next century in order to extend their service life by 15 years into the 2020s. The first two units (USS ***Nimitz***, commissioned in May 1975, and USS ***Dwight D. Eisenhower***, commissioned in October 1977) are currently assigned to the Atlantic Fleet whilst the USS ***Carl Vinson***, commissioned in February 1982, is assigned to the Pacific. Next to commission, in 1987, will be the USS ***Theodore Roosevelt***, followed in 1989 and 1991 respectively by the USS ***Abraham Lincoln*** and ***George Washington.*** Two further units are projected.

Specification

Displacement: 81,600 tons standard, 91,487 tons full load or (*Theodore Roosevelt* onwards) 96,351 tons full load
Dimensions: length 332.9 m (1,092 ft); beam 40.8 m (134 ft); draught 11.3 m (37 ft); flightdeck width 76.8 m (252 ft) or (*Theodore Roosevelt* onwards) 78.4 m (257 ft)
Machinery: four-shaft geared steam turbines (two A4W/A1G nuclear reactors) delivering 280,000 shp (208795 kW)
Speed: 35 kts
Aircraft: 24 F-14A Tomcat, 24 A-7E Corsair, 10 A-6E Intruder, 4 KA-6D Intruder, 4 EA-6B, 4 E-2C, 10 S-3A, 6-8 SH-3H and provision for 1 C-2A
Armament: three octuple Sea Sparrow SAM launchers (no reloads) in first two, or four 20-mm Phalanx close-in weapon systems (CIWS) in others
Electronics: (first three) one SPS-48B 3D radar, one SPS-43A air-search radar, one SPS-10F surface-search radar, one LN-66 navigation radar, two SPN-42, one SPN-43A and one SPN-44 aircraft landing aids, one URN-20 TACAN system, three Mk 115 (except *Carl Vinson* (Mk 91)) fire-control radars, one SLQ-29 ESM suite, four Mk 36 Super RBOC chaff launchers
Electronics: (second three) one SPS-53 navigation radar, one SPS-55 surface-search radar, one SPS-48C 3D radar, one SPS-65 air-search radar, one SPN-44, one SPN-41 and one SPB-35A aircraft landing aids, one TACAN system, three Mk 91 fire-control radars, one SLQ-29 ESM suite and four Mk 36 Super RBOC chaff launchers
Complement: 3,300 plus 3,000 air group

Nimitz in Action

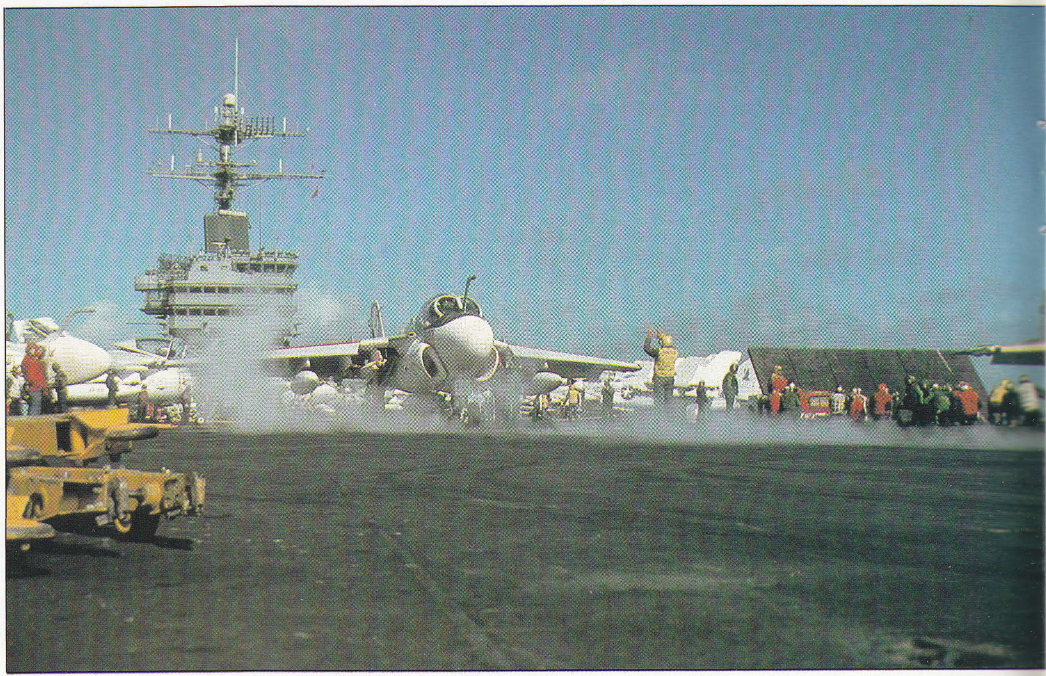
The 'Nimitz' class nuclear-powered carriers are an outstanding example of US military power. With a crew of over 6,000 and an air group of 90 aircraft, they are to provide the backbone of the USA's Carrier Battle Group well into the 21st century, and have the capacity to meet any projected air, sea or submarine threat.

Large aircraft-carriers, such as the USS *Nimitz* and her sisters, are the most flexible warships at sea today, being able to graduate their response appropriately to any situation from disaster relief to nuclear war. Only the US Navy can currently afford such ships, which cost over $2 billion each and demand an annual operating budget approaching that of the entire Royal Navy. By the early 1990s, the USN plans to have 15 such ships, seven of which will be nuclear-powered. By then the oldest, the USS *Forrestal* (CV 59), will be 35 years old and, despite a major updating in the Service Life Extension Program (SLEP), will have less than a decade of useful life left to her. Unless the perceived threat from the Eastern bloc decreases, therefore, the building programme will need to extend beyond the planned USS *George Washington* (CVN 73) if the minimum of 15 large flightdecks is to be retained.

Each of such carriers usually forms the nucleus of a fast task group, designated a Carrier Battle Group (CBG). Apart from her aircraft the carrier has no offensive power, and her capacity to defend herself is minimal. To realize her full potential, therefore, she needs to be complemented by escorts that can both defend her and, if possible, enhance her performance, especially in such roles as anti-submarine warfare. The group will also contain support ships with full UNREP (underway replenishment) and VERTREP (vertical replenishment) facilities. Thus each element of the group is mutually supportive.

Nuclear-powered or not, all of the large US carriers bear a strong similarity. The USS *Nimitz* (CVN 68) was the first 'production model' nuclear ship following a lengthy evaluation of the prototype USS *Enterprise* (CVN 65), completed no less than 14 years earlier, in 1961. Advances in nuclear engineering had been such that the eight reactors required by the prototype were reduced to only two in the *Nimitz* and later vessels. These are expected to last about 13 years between re-corings, and allow the ship to maintain almost unlimited high speeds. It should be remembered, however, that to operate over 90 aircraft and support a crew of over 6,000 men, the *Nimitz* still needs to replenish about every second week in such staples as aviation fuel, ordnance, dry stores and foodstuffs.

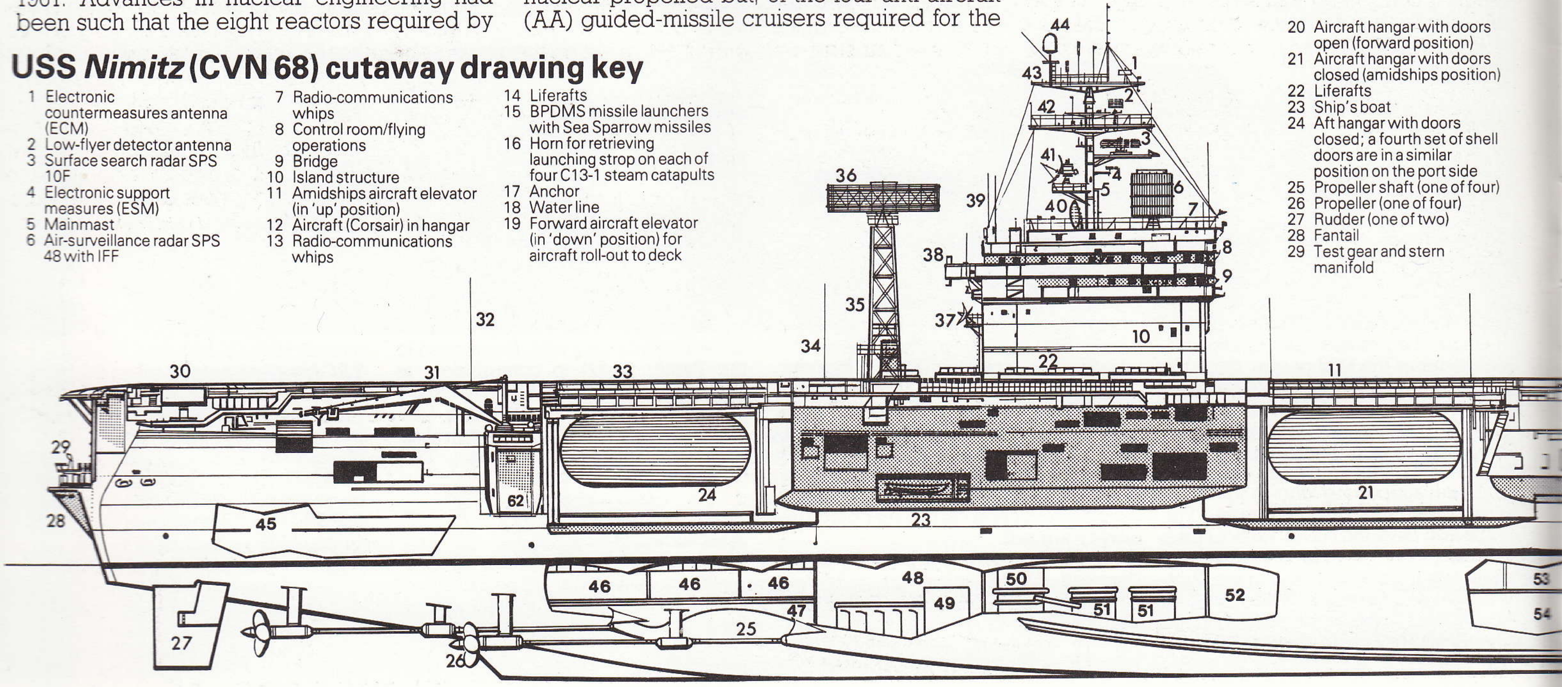
Ideally the *Nimitz*'s escort would also be nuclear-propelled but, of the four anti-aircraft (AA) guided-missile cruisers required for the inner defence ring, cost limitations are likely to limit the nuclear craft to only one or two, one of



While aircraft are being operated, the broad expanse of USS* Nimitz*'s flight deck seethes with activity. Here a Grumman A-6 Intruder is about to be launched.

USS *Nimitz* (CVN 68) cutaway drawing key

1 Electronic countermeasures antenna (ECM)
2 Low-flyer detector antenna
3 Surface search radar SPS 10F
4 Electronic support measures (ESM)
5 Mainmast
6 Air-surveillance radar SPS 48 with IFF
7 Radio-communications whips
8 Control room/flying operations
9 Bridge
10 Island structure
11 Amidships aircraft elevator (in 'up' position)
12 Aircraft (Corsair) in hangar
13 Radio-communications whips
14 Liferafts
15 BPDMS missile launchers with Sea Sparrow missiles
16 Horn for retrieving launching strop on each of four C13-1 steam catapults
17 Anchor
18 Water line
19 Forward aircraft elevator (in 'down' position) for aircraft roll-out to deck
20 Aircraft hangar with doors open (forward position)
21 Aircraft hangar with doors closed (amidships position)
22 Liferafts
23 Ship's boat
24 Aft hangar with doors closed; a fourth set of shell doors are in a similar position on the port side
25 Propeller shaft (one of four)
26 Propeller (one of four)
27 Rudder (one of two)
28 Fantail
29 Test gear and stern manifold



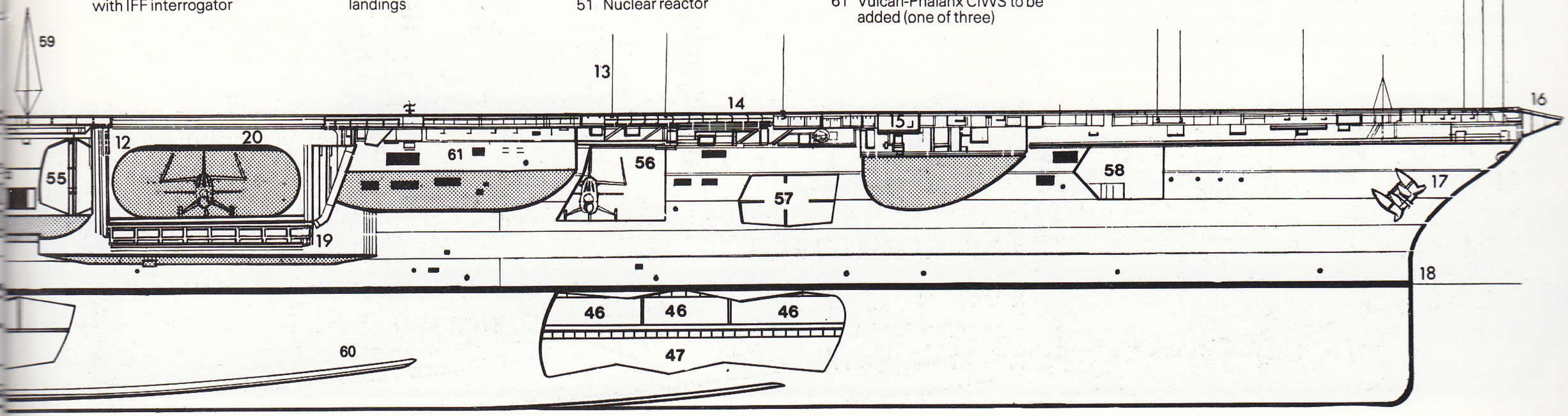
Second of the 'Nimitz' class, USS Dwight D. Eisenhower *is seen here alongside the nuclear-powered missile cruiser USS* California *whilst on a training exercise in the Caribbean in 1978.*

which should be Aegis-equipped to coordinate the group's total defence effort against a saturation attack of the type so much exercised by the Soviets. The outer defences should comprise destroyers with high-quality AA and anti-submarine capacity but, until the planned 600-ship navy is a reality, frigates are often used in the role. A hidden component is the force of one or two SSNs which normally accompanies a task group, with the primary task of neutralizing any enemy SSGN (nuclear-powered cruise missile submarine) that would be a part of an integrated assault.

The *Nimitz* carries a mixed bag of aircraft for interception, strike, reconnaissance, anti-submarine, early warning, electronic warfare and communication purposes. Stowed cheek-by-jowl in a single large hangar, their movement to the flight deck occupies the attentions of a dedicated office and is possible only by virtue of four side elevators working within the envelope of the enormous overhangs of the hull. Although the overall length of individual ships can vary between 318 and 332 m (1,043 and 1,089 ft) the width of flightdeck is consistent at about 77 m (253 ft), about twice the beam of the hull proper.

In plan the flightdeck allows, theoretically, for recovery of aircraft to take place simultaneously with launch; V/STOL aircraft are not carried (being viewed as aircraft of lower performance configured for use with the US Marine Corps' requirements in amphibious warfare) so wind-over-deck is still a significant factor despite the considerable power in both steam catapults and the aircraft themselves. With two catapults forward and two in the angle, aircraft can be put into the air every 30 seconds or so, the flightdeck an organized bedlam. Deck crews are colour-coded and drilled to perfection, for speech is impossible. Jet blast is deflected by specially-designed

30	BPDMS missile launcher with Sea Sparrow missiles (also on port quarter)
31	Aircraft/stores cranes
32	Radio-communications whips
33	Aft aircraft elevator (in 'up' position)
34	Radio-communications whips
35	SPS 43A radar mast
36	SPS 43A air search radar with IFF interrogator
37	Elements of SPN 42 and 44 carrier-controlled approach (CCA) radars for blind landings
38	Satellite communications antenna
39	Radio-communications whips
40	Elements of SPN 42 and 44 carrier-controlled approach (CCA) radars for blind landings
41	SPN 43 Air Traffic Control radar
42	ECM intercept antenna
43	Infra-red beacons
44	RACAN beacon
45	Machine shop
46	Ammunition
47	Aviation fuel
48	Machine room
49	Turbines
50	Boilers
51	Nuclear reactor
52	Auxiliary machine room
53	Stores
54	Machine shop/aviation stores
55	Fireproof door in hangar
56	Hangar, forward bulkhead
57	Ship's stores/crew
58	Aviation machine shop
59	Conical-monocone communications antenna
60	Roll-damping bilge keels
61	Vulcan-Phalanx CIWS to be added (one of three)



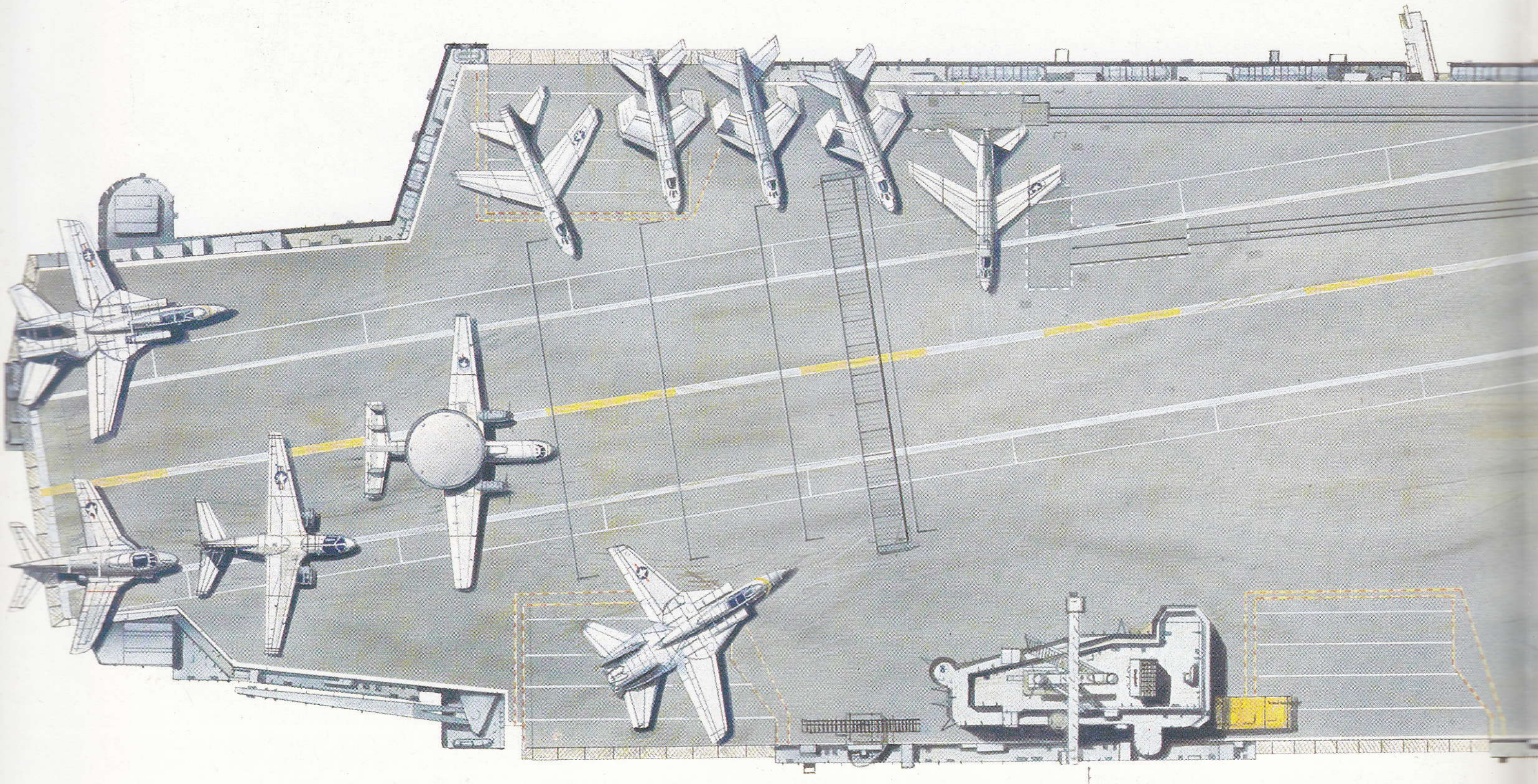
deck flaps, but the whole area is still black with oil and rubber. Even the island's lower regions are painted to match, and their toughened windows are often crazed by the heat.

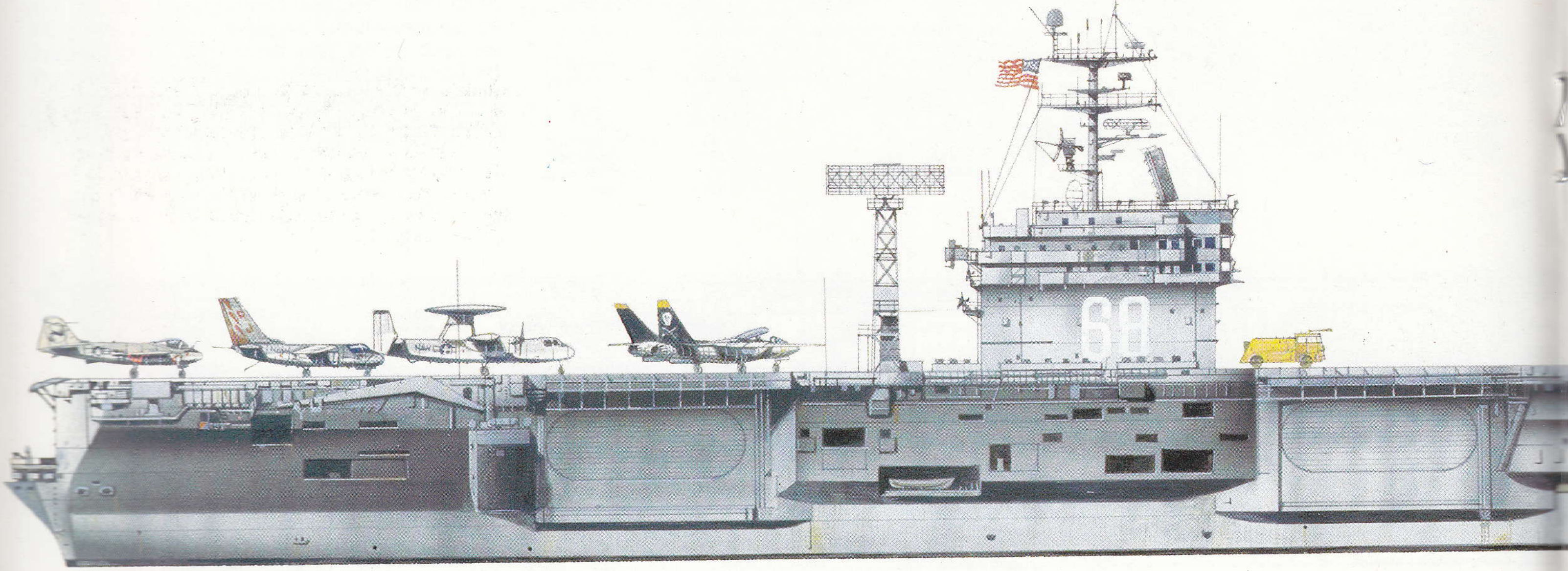
Two squadrons of Grumman F-14 Tomcat fighter/interceptors are aboard, Mach 2.4 aircraft each capable of carrying six Phoenix AAMs. There are three attack squadrons of Grumman A-6 Intruders and Vought A-7 Corsairs, some of the Intruders being configured as tankers to increase strike radius. One squadron each of fighters and strike aircraft had to be landed in favour of an ASW contingent, when the carriers were recategorised CV/CVN (multi-role aircraft-carrier) from CVA/CVAN (attack aircraft-carrier) in 1975. This was due primarily to the smaller and older flightdecks previously employed being rapidly deleted. As a result two anti-submarine squadrons (one each of Lockheed S-3 Vikings and Sikorsky SH-3 Sea Kings) are allocated. The remainder is composed of a mixed bag of Grumman EA-6 Prowlers for electronic warfare and Grumman E-2 Hawkeyes for both early warning and aircraft direction. A Grumman C-2A Greyhound is also embarked for Carrier On-board Delivery (COD).

When it is remembered that an F-14 weighs nearly 34 tonnes at launch and that a Hawkeye has a wingspan of 24.56 m (80 ft 7 in), it is apparent that the size and weight of a specified number of aircraft of given performance determine the major parameters of these giant ships. Despite a vocal lobby extolling the virtues of more, but smaller decks, the reduction in capability that these would represent has consistently militated against their construction.

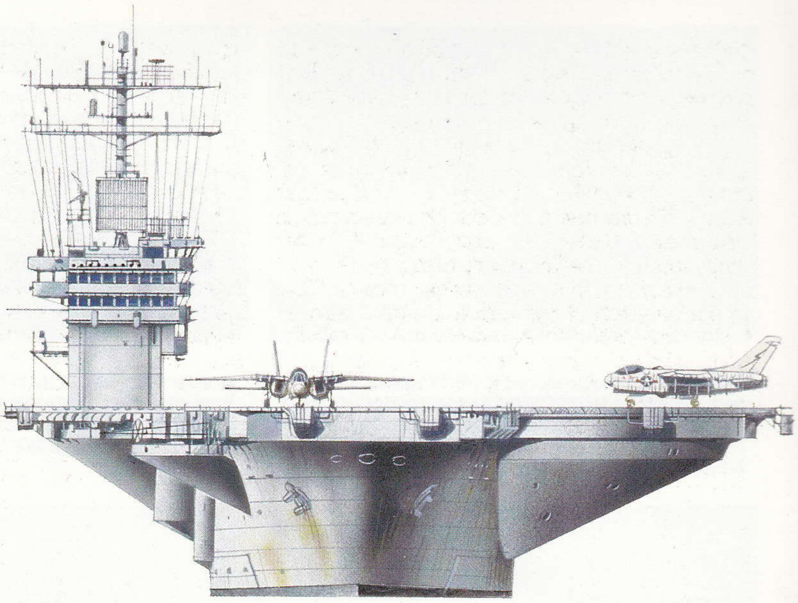
Critics, however, may argue that the awesome muscle displayed by a carrier group is a concept last tested in anger nearly 40 years ago and is, today, valid only for limited-war scenarios. The reason for this is that the Soviets, lacking a similar strength, have concentrated much effort toward anti-carrier warfare (ACW), the success of which would be dependent upon a mounting saturation attack by a combination of aircraft with stand-off weapons, surface ships with long-range SSMs and submarines with anti-ship missiles and torpedoes. In answer to this, the Aegis cruiser normally allocated to the force would be capable of conducting a multi-point defence, assessing each of a large number of simultaneous threats and, via an intership data link, allocating the most appropriate ship systems for the threats' neutralization.

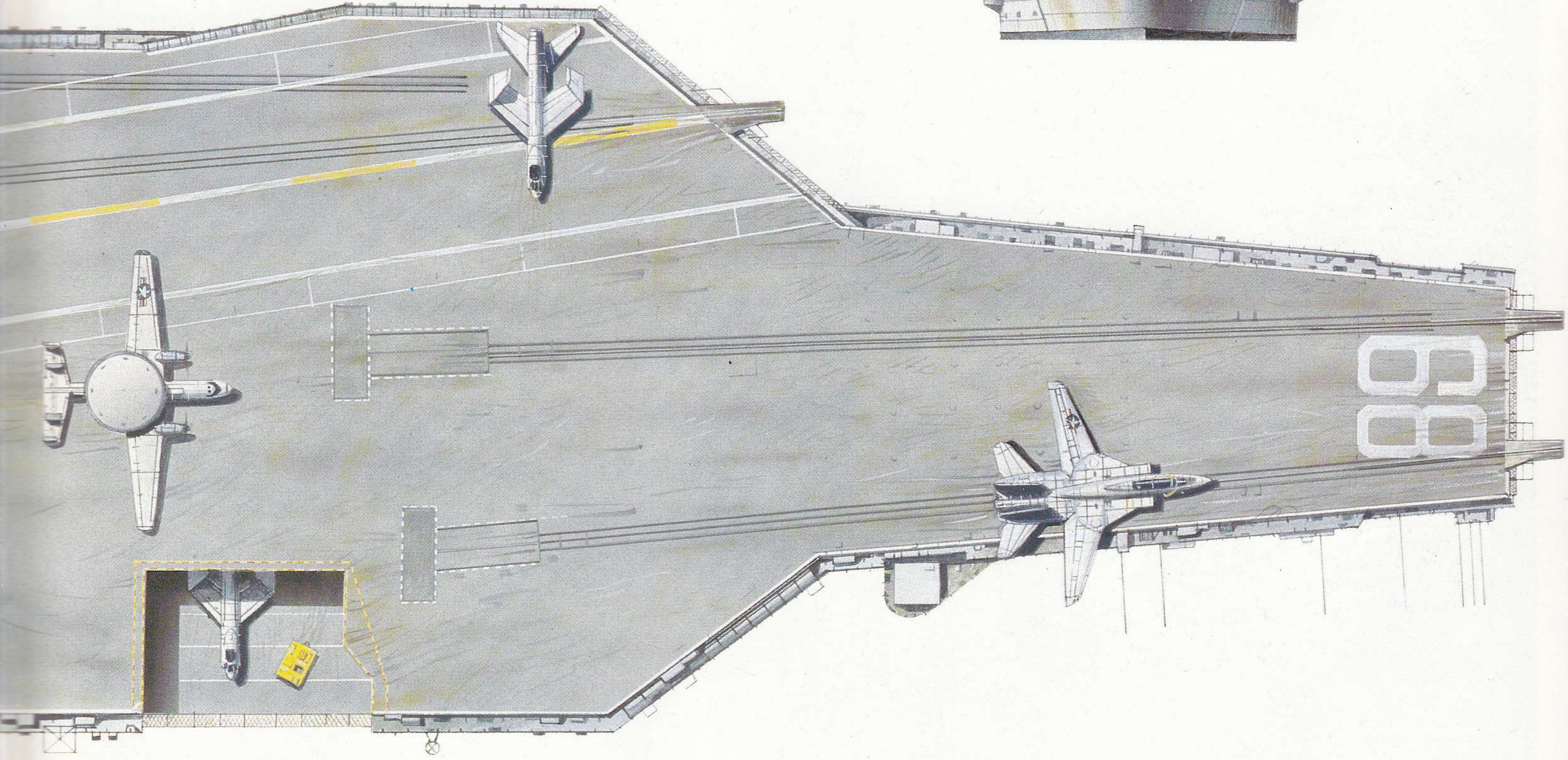
There is mounting evidence, though, that the



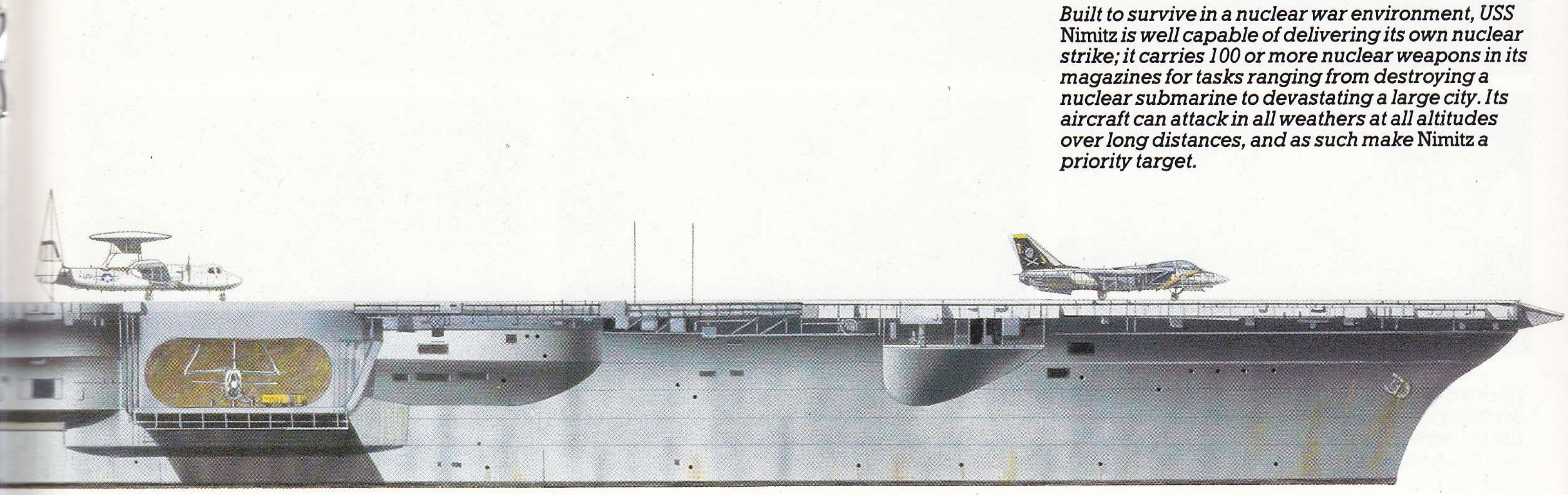


Soviets would pre-emptively 'go nuclear' at sea with low-yield weapons, reasoning that escalation to all-out nuclear war on land would be unlikely and that any risk would be justified by the potential gains, for the linchpin of USN strategy lies in its 15 carrier groups. Each is invariably dogged by a Soviet 'tattletail' which constantly updates positional co-ordinates. The several square kilometres occupied by such a large body of ships could be targeted not only by one of the many obsolescent, but still useful, Soviet SSGNs but also by ballistic missiles from deep inside Soviet territory. Even so, any shortcomings aside, the Americans will need to build future Nimitzes as long as the Soviets, who are currently constructing their first 70,000-tonner, show interest. In conventional war at sea, he who has aviation support will prevail over him who does not.

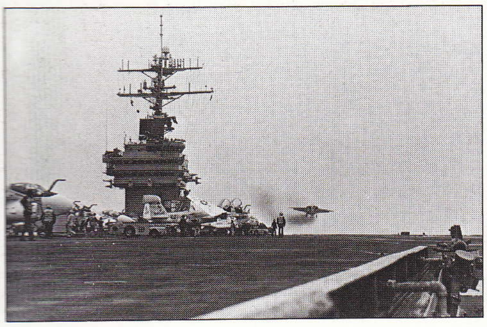




Built to survive in a nuclear war environment, USS Nimitz *is well capable of delivering its own nuclear strike; it carries 100 or more nuclear weapons in its magazines for tasks ranging from destroying a nuclear submarine to devastating a large city. Its aircraft can attack in all weathers at all altitudes over long distances, and as such make* Nimitz *a priority target.*



Nimitz in Action



Above: A North American RA-5C Vigilante recovers aboard USS Nimitz *after a training exercise. All the flight deck operations are controlled from the uppermost of the three bridge levels seen on the island superstructure.*

Above: The sheer size of USS Nimitz *can be gauged by comparing her to the tugs assisting her to berth after a deployment to Northern Europe as part of Nuclear Task Force 75 during annual NATO exercises.*

Above: The captain on the bridge of USS Nimitz*, during preparations for docking after completion of a set of sea trials that formed part of her acceptance programme into the US Navy in 1975.*

Above: Dotted around the flight deck are several pit areas where personnel can shelter whilst flight operations are in progress. These are also used to monitor work for safety reasons.

Left: Built into the flight deck are several points with aviation fuel line hoses to allow the rapid turnaround of aircraft without the need to go below to the hangar deck.

Right: USS Eisenhower *(foreground) and USS* Nimitz *are seen during the Indian Ocean Battle Group changeover in 1980. The escort is the nuclear-powered guided missile cruiser USS* South Carolina.

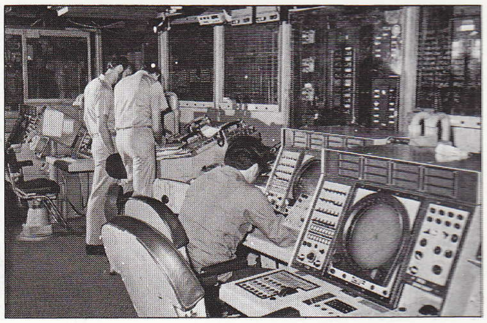
Above: The enlisted men's shop aboard USS Nimitz *provides all the sundry personal items that are not part of regular US Naval issue, except for alcohol, which is banned aboard US ships.*

Above: One of the several galley areas aboard Nimitz*, providing a 24-hour service for the enlisted men. Officers have their own dining facilities, whilst the Captain and Admiral eat separately.*

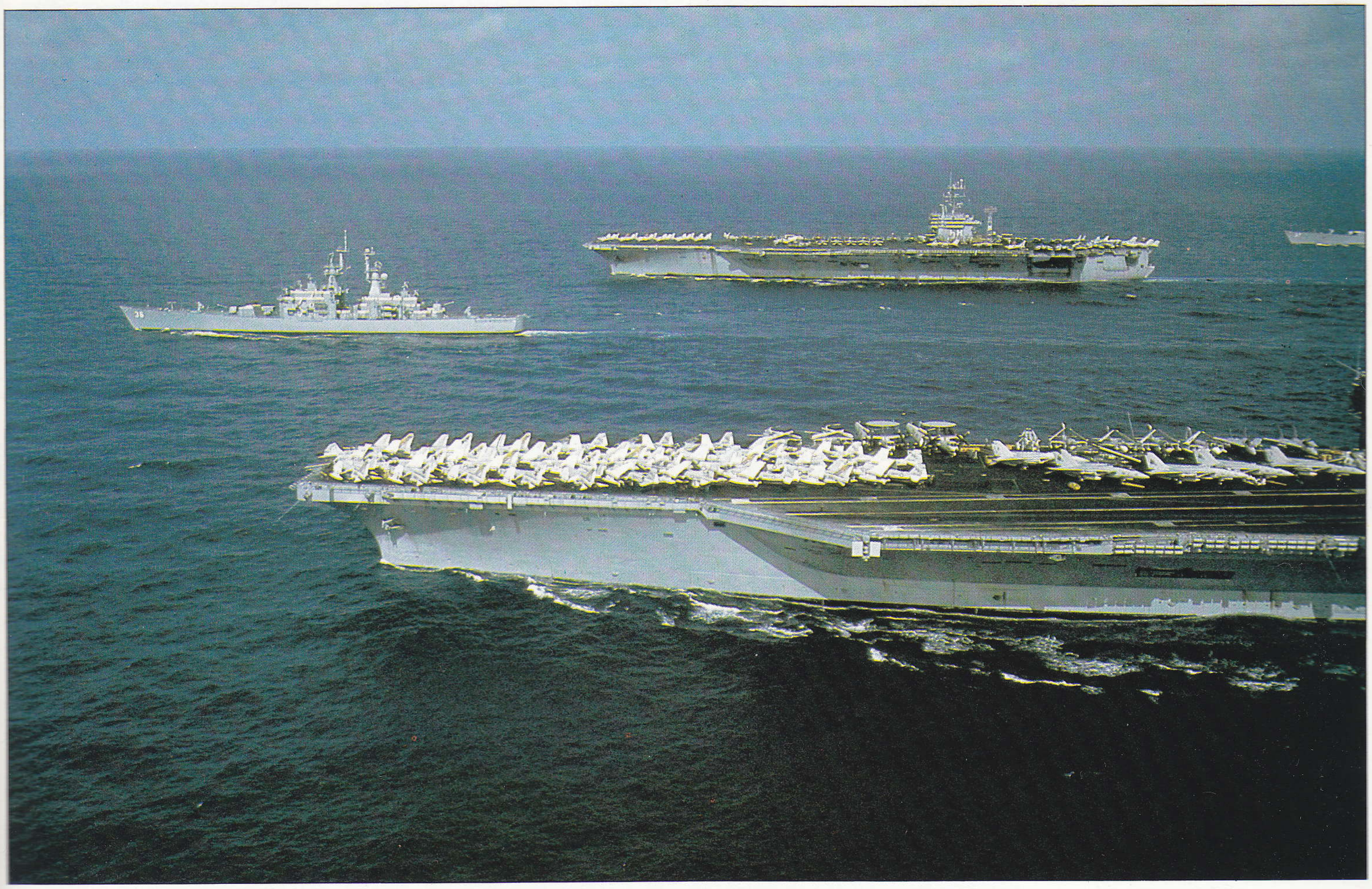
Above: The enlisted men's mess is open round the clock to cater for the watch routine adopted by the ship whilst at sea. Other facilities exist for the POs and officers.

Above: The flying control bridge of Nimitz's island, from where primary control of all flight operations is exercised during carrier evaluations.

Above: Another view of Nimitz's bridge shows clearly the multitude of equipment required to control the ship during normal peace-time operations. In wartime, control passes to the ops room.

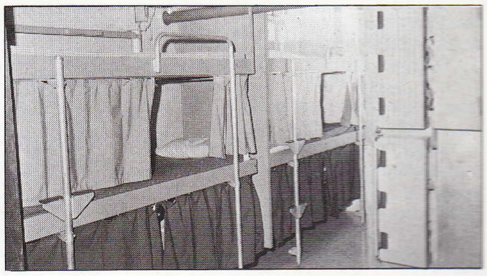


Above: The nerve centre of the ship is the Combat Information Centre, which monitors the air, sea and sub-surface environment around the Carrier Battle Group using all available sensors.



Above: Found in almost every military establishment is the barber's shop, where the enlisted men have their hair trimmed to the regulation length and style; the American navy is no different.

Above: The Captain's in-port cabin has facilities for entertaining and for meetings and briefings. At sea he has a less opulent cabin, and spends the majority of his time on his bridge or in the CIC.

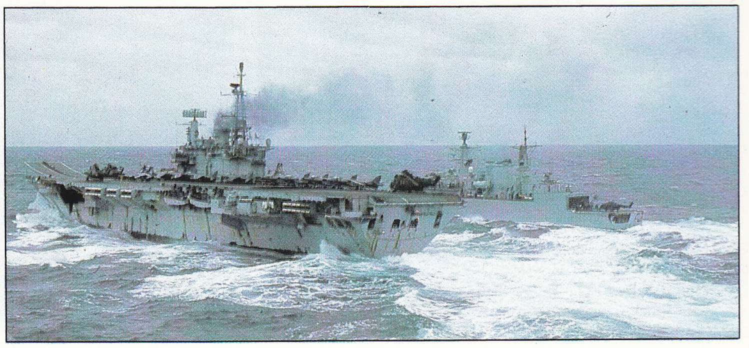


Above: Typical of the accommodation aboard USS Nimitz are these bunks for CPOs. The crew of 6000-plus allows little privacy for any but the most senior officers.

UK

Hermes

The original post-war HMS *Hermes* was the sixth vessel of the 'Centaur' class, but in October 1945 she was cancelled and the name given to the *Elephant* of the same class. As very little work had been done on this hull the vessel was able to benefit from a complete redesign and was thus commissioned in November 1959 with a 6½° angled flightdeck, a deck-edge aircraft lift as one of the two lifts fitted, and a 3D radar system. In 1964-6 the new HMS ***Hermes*** was refitted with two quadruple Seacat SAM systems in place of her original AA armament of five twin 40-mm Bofors mountings, and access to the seaward side of the island was constructed. In 1971 in a further refit the Type 984 3D radar was replaced by a Type 965 'bedstead' system, and a comprehensive deck landing light system was fitted after the ship had been paid off for conversion to a commando assault carrier, as she could operate only a 28-aircraft group of de Havilland Sea Vixen, Blackburn Buccaneer and Fairey Gannet fixed-wing aircraft but not the modern McDonnell Douglas Phantoms. During this conversion the *Hermes* also lost her arrester wires and catapult, and was converted to carry a complete Marine Commando unit with its associated squadron of Westland Wessex assault helicopters. By 1977 the *Hermes* was again in refit to become an ASW carrier, though she retained the Commando carrying ability. As such she carried nine Westland Sea King ASW and four Wessex HU.Mk 5 utility helicopters. In 1980 the *Hermes* began her third major conversion to change her role yet again, this involving a strengthening of the flight deck and the provision of a 7½° ski-jump ramp overhanging the bow to allow the operation of five BAe Sea Harriers in place of the Wessexes. In 1982, because of her more extensive communications fit and greater aircraft-carrying ability, the *Hermes* was made the flagship of the task force sent to recover the Falklands. During this operation she initially operated an air group of 12 Sea Harriers, nine Sea King HAS.Mk 5s and nine Sea King HC.Mk 4s. However, as the campaign progressed this was modified to 15 Sea Harriers, six Harrier GR.Mk 3s, five ASW Sea Kings and two Westland Lynxes (equipped for Exocet decoy operations). Following her success in the Falklands it was announced that the *Hermes*, after a series of deployment in 1983, will be refitted at the end of the year and then used in a training ship capacity in harbour because she is too 'labour intensive' and not converted to use Dieso (the Royal Navy's current fuel type). Like the 'Invincibles' the *Hermes* carries nuclear depth bombs for her helicopters and tactical gravity bombs for the Sea Harriers. Based on comparisons with the American carriers, the number of nuclear weapons carried in these ships is probably around 15, of which approximately 10 would be for ASW purposes.

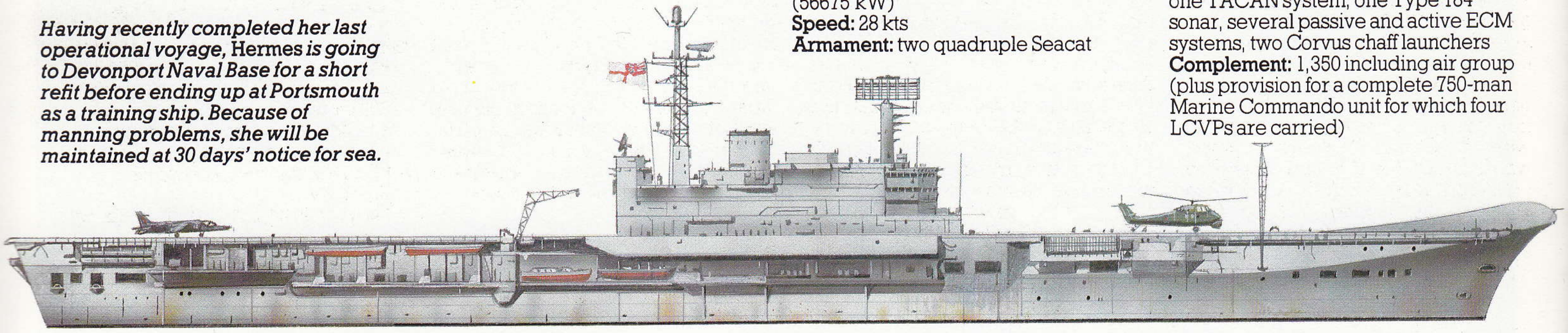


HMS** Hermes **with her goalkeeper, a Type 22 frigate, steaming in heavy weather. The Type 22 provides the necessary close-in anti-aircraft and anti-missile defence with the Sea Wolf SAM system that the carrier lacks;** Hermes **has two Seacat launchers.

Specification

Displacement: 23,900 tons standard, 28,700 tons full load
Dimensions: length 226.9 m (744 ft 4 in); beam 27.4 m (90 ft); draught 8.7 m (28 ft 6 in); flightdeck width 48.8 m (160 ft)
Machinery: two-shaft geared steam turbine delivering 76,000 shp (56675 kW)
Speed: 28 kts
Armament: two quadruple Seacat SAM launchers (estimated 40 missiles carried)
Aircraft: normal five (to be increased to six) Sea Harriers and nine Sea King ASW helicopters; maximum see text
Electronics: one Type 965 air-search radar, one Type 993 surface-search radar, one Type 1006 navigation radar, two GWS22 Seacat guidance systems, one TACAN system, one Type 184 sonar, several passive and active ECM systems, two Corvus chaff launchers
Complement: 1,350 including air group (plus provision for a complete 750-man Marine Commando unit for which four LCVPs are carried)

Having recently completed her last operational voyage, Hermes is going to Devonport Naval Base for a short refit before ending up at Portsmouth as a training ship. Because of manning problems, she will be maintained at 30 days' notice for sea.

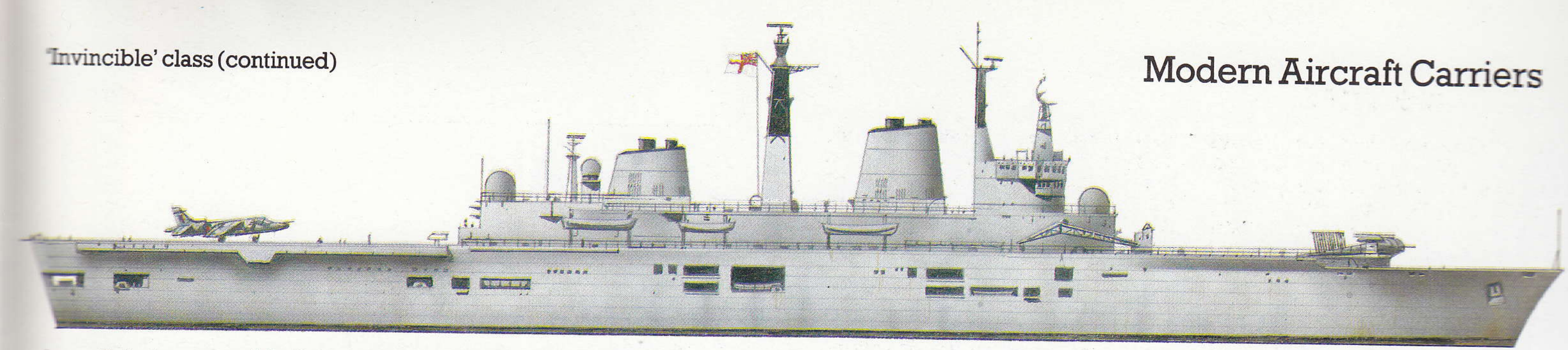


UK

'Invincible' class

The demise of the British fixed-wing aircraft-carrier, when the CVA01 fleet carrier replacement programme was cancelled in 1966, resulted in the issue during the following year of a Staff Requirement for a 12,500-ton command cruiser equipped with six Westland Sea King ASW helicopters. A redesign of this basic concept to give more deck space (and the results from several operational analysis studies) showed that a nine-helicopter air group was much more effective. These new specifications resulted in a design draft which became known as the 19,500-ton 'through deck cruiser' (TDC) design, the term TDC being used for what was essentially a light carrier design because of the political sensitivity with which politicians viewed the possibility of a carrier resurrection at the time. Despite this the designers showed initiative in allow-

HMS** Invincible **with several Sea Harriers on the flight deck. The slant of the forward ski-jump can readily be seen; this enables the V/STOL fighters to take off with larger fuel and ordnance loads than they could normally carry, a factor which was very useful during the Falklands war.



ing sufficient space and facilities to be incorporated from the outset for a naval version of the RAF's V/STOL fighter programme that might surface. The designers were duly awarded for such foresight in May 1975 when it was announced officially that the TDC would carry the BAe Sea Harrier. Thus the first of the class, HMS **Invincible**, which had been laid down in July 1973 at the Vickers shipyard at Barrow-in-Furness, was not delayed during building. In May 1976 the second ship, HMS **Illustrious**, was ordered, and in December 1978 the third, HMS **Indomitable**, was contracted. However, as a result of public disquiet caused by the paying off of the last fixed-wing carrier, HMS *Ark Royal*, the Admiralty decided to change the name of the *Invincible* to HMS ***Ark Royal*** in order to placate public opinion. The ships were commissioned in July 1980, June 1982 and (planned) November 1984.

The ships of the class are the largest gas turbine-powered warships in the world, with virtually every piece of equipment below decks, including the engine modules, suitable for maintenance by exchange. During building both the *Invincible* and the *Illustrious* were fitted with 7° ski-jump ramps, whilst the *Ark Royal* will be completed with a 15° ramp. In February 1982 in what can only be classed as one of the classic defence disaster statements of all time, it was announced that the *Invincible* was to be sold to Australia as a helicopter carrier to replace the *Melbourne* so that only two carriers would remain in British service. However, this deal was cancelled after the Falklands campaign, to the relief of the naval high command, as it was realized by the government that three carriers ought to be available to ensure two in service at any one time. During Operation 'Corporate' the *Invincible* started with an air group of eight Sea Harriers and nine Sea King HAS.Mk 5 ASW helicopters. However, as a result of losses and replacements this was modified to a group of 11 Sea Harriers, eight ASW Sea Kings and two Lynx helicopters configured for Exocet decoy duties. One of the problems was that most of the extra aircraft had to be accommodated on the deck as there was insufficient rooom for them in the hangar. The *Illustrious* was hurried through to completion in time to relieve the *Invincible* after the war, and she went south with 10 Sea Harriers, nine ASW Sea Kings and two AEW Sea King conversions. She and her sisterships were also fitted with two American 20-mm Phalanx Gatling gun CIWS for anti-missile defence and two single 20-mm AA guns to improve on the previous nonexistent close-in air defences. It is expected that once the current problems with the procurement of AEW radar systems are resolved then the normal air group will consist of six Sea Harriers (up from the current five), nine ASW Sea Kings and two AEW Sea Kings. All three carriers carry nuclear weapons for their air groups. According to official sources the Sea Kings can carry US nuclear depth bombs, and the Sea Harriers are believed to be able to carry tactical nuclear gravity bombs. If this is correct then the former are probably the same type as carried by RAF BAe Nimrods, almost certainly the 227-kg (500-lb) American B57 type with a 10-kt yield. The tactical bombs, according to one British source, are variable-yield weapons (between 1 and 70 kt), British designed and built, and known by the codename Green Parrot. It was also implied by the same source that in the 1-kt yield version the bomb could be used as an anti-submarine weapon by the Sea Kings. Such an idea is highly likely as the more modern Green Parrot would logically be suited both to complement the greater-yield weapon on the bigger ASW aircraft and helicopters, and to become the nuclear armament said to be carried by the lighter ASW helicopters such as the Lynx and Westland Wasp. In addition the lower-yield (by a factor of 10) weapon would be particularly useful in combat scenarios where the use of the higher-yield weapon would cause considerable operational problems to friendly units such as submarines.

Although more flexible in operations than fixed-wing carriers, 'Invincible' class ships suffer from inadequate numbers of fighters and have no fixed wing AEW aircraft, though the new Sea King AEW helicopter may help.

Specification

Displacement: 16,000 tons standard, 19,500 tons full load
Dimensions: length 206.6 m (677 ft); beam 27.5 m (90 ft); draught 7.3 m (24 ft); flightdeck width 31.9 m (105 ft)
Machinery: two-shaft gas turbine (4 Rolls-Royce Olympus TM3B) delivering 112,000 shp (83,520 kW)
Speed: 28 kts
Armament: one twin GWD30 Sea Dart area-defence SAM launcher (22 missiles), two 20-mm Phalanx CIWS and two single 20-mm AA
Aircraft: see text
Electronics: one Type 1022 air-search radar, one Type 002R air search radar, two Type 909 Sea Dart guidance radars, two Type 1006 navigation and helicopter direction radars, one Type 184 or Type 2016 bow-mounted sonar, one Type 762 echo sounder, one Type 2008 underwater telephone, one ADAWS 5 action information data-processing system, one UAA1 Abbey Hill ESM suite, two Corvus chaff launchers
Complement: 1,000 plus 320 air group (with provision for a Marine Commando in extreme circumstances)

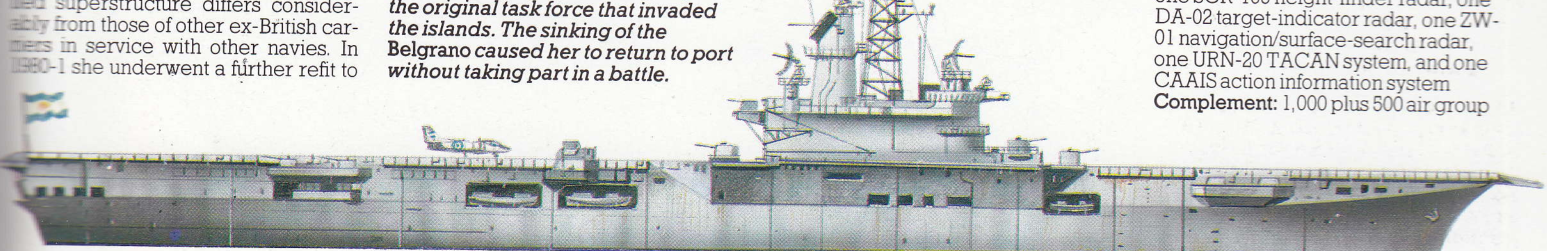
ARGENTINA

Veinticinco de Mayo

The ***Vienticinco de Mayo*** (25 May) was originally a 'Colossus' class carrier purchased from the UK by the Dutch and commissioned into the Royal Netherlands navy on 28 May 1948. In April 1968 the ship suffered a serious boiler room fire, and was subsequently judged to be uneconomical to repair. In the following October Argentina bought the vessel, which was refitted and commissioned into the Argentinian navy in the Netherlands. She sailed for Argentina on 1 September 1969. The vessel is fitted with a modified Ferranti CAAIS data-processing system and Plessey Super CAAIS console displays. This system allows the ship to control her carrier-based aircraft and to communicate via data links with the two Type 42 destroyers of the Argentinian navy and their ASAWS 4 action information systems. Her modified superstructure differs considerably from those of other ex-British carriers in service with other navies. In 1980-1 she underwent a further refit to increase the strength of the flightdeck and add extra deck space to allow two extra aircraft to be parked in readiness for the Dassault-Breguet Super Etendards that Argentina was acquiring. Luckily for the UK none of these strike aircraft had qualified to land on the carrier by the time of the Falklands war, and the carrier's air group consisted of eight McDonnell Douglas A-4Q Skyhawks, six Grumman S-2E Trackers and four Sikorsky SH-3D Sea Kings. The *Veinticinco de Mayo* played a major part in the initial landings on the Falklands and was ready to launch a strike against the British task force on 2 May 1982 when fate intervened in the form of poor flying conditions. The subsequent sinking of the *Belgrano* then forced the Argentine carrier to retire to the relative safety of Argentina's coastal waters, where she played no further part in the proceedings and landed her air group for land-based operations. After the Argentine loss of the Falklands the remaining Super Etendards were delivered. These were rapidly deck-qualified and the new make-up of the air group is now believed to be 20 fixed-wing and four rotary-wing aircraft. Available evidence indicates that the actual composition will probably be eight Super Etendards, six A-4 Skyhawks, six S-2E Trackers and four Sea Kings, the Skyhawk mark being unspecified as Argentina is believed to have taken delivery of 24 ex-Israeli A-4E and A-4H aircraft for eventual naval use.

Specification

Displacement: 15,892 tons standard, 19,896 tons full load
Dimensions: length 211.3 m (693 ft 3 in); beam 24.4 m (80 ft 0 in); draught 7.6 m (25 ft 0 in); flight deck width 42.4 m (138 ft 5 in)
Machinery: two-shaft geared steam turbines delivering 40,000 shp (29830 kW)
Speed: 24.25 kts
Armament: nine single 40-mm AA
Aircraft: see text
Electronics: one LW-01 air-search radar, one LW-02 air-search radar, one SGR-109 height-finder radar, one DA-02 target-indicator radar, one ZW-01 navigation/surface-search radar, one URN-20 TACAN system, and one CAAIS action information system
Complement: 1,000 plus 500 air group



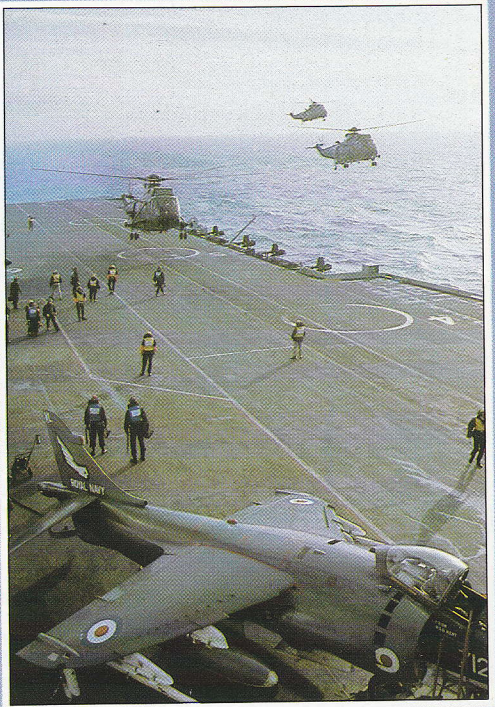
The main target for the British SSN force during the Falklands was* Vienticinco de Mayo*, the flagship of the original task force that invaded the islands. The sinking of the* Belgrano *caused her to return to port without taking part in a battle.

Carrier Operations in the Falklands

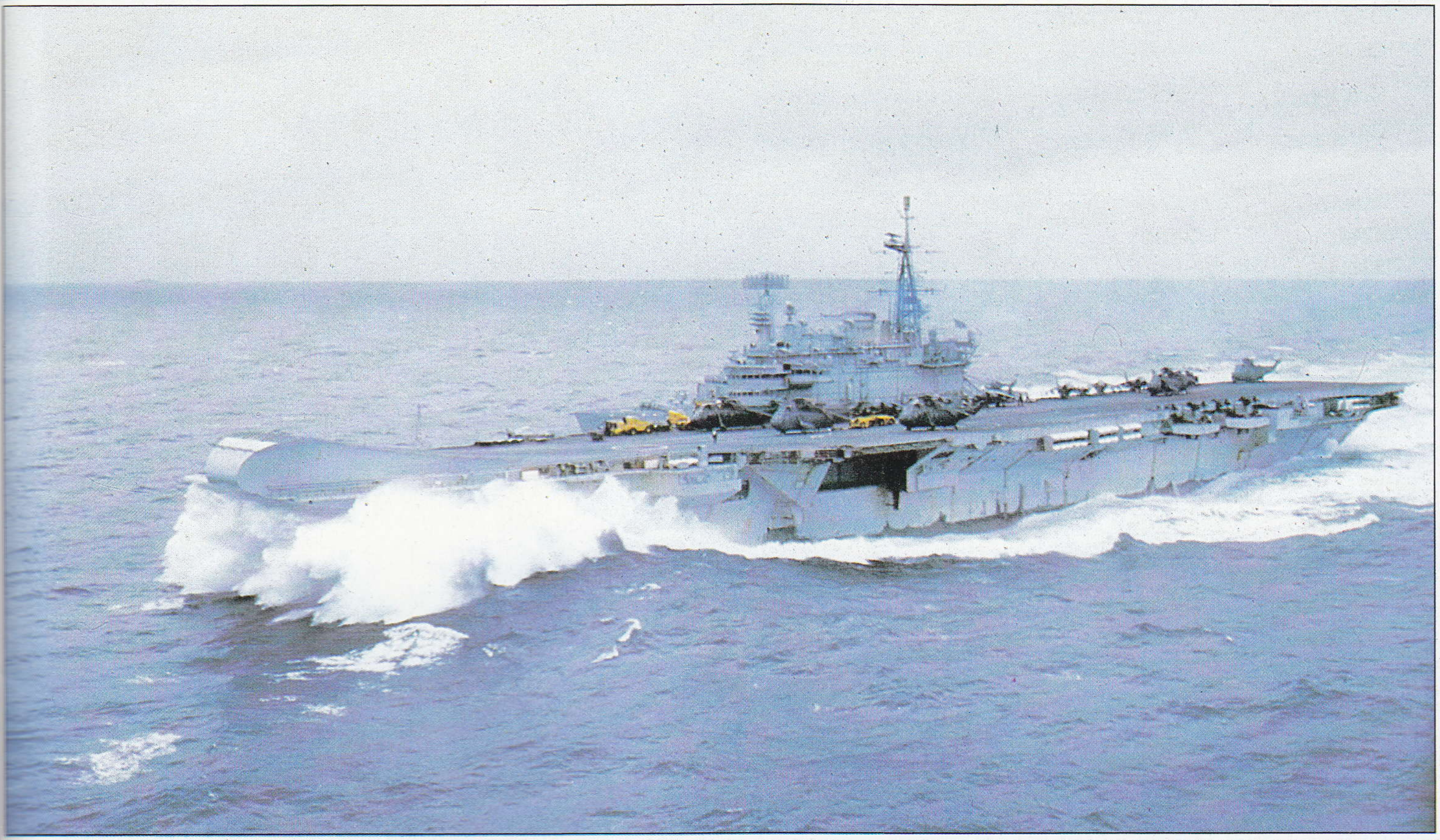
The Falklands provided the testing ground for the Sea Harrier and the V/STOL carrier concept. Although the former was proved beyond doubt, several serious deficiencies were uncovered in the latter, not least of which was the complete lack of any organic airborne early warning.

For Operation 'Corporate' the Royal Navy grouped its only two active carriers together to form the backbone of the task force sent south, their air groups reinforced with extra BAe Sea Harriers, and additional assault helicopters embarked on HMS *Hermes*. The preparations for war were mostly completed over the weekend before the 5 April 1982, when both the *Hermes* and HMS *Invincible* were loaded with munitions and stores at Portsmouth. Sailing together on that date, with the *Hermes* designated as force flagship, they left the port to a tremendous and very moving send-off that few who witnessed it will ever forget. Once land was left behind, however, the reality of the situation became apparent as the ships' crews, operational planners and squadron personnel embarked quietly assessed the enormity of the situation and the fact that without the Sea Harriers there could be no recapture of the Falklands. Thus during the steady advance southwards to Ascension Island and beyond, the ships began the thorough and very methodical training required to bring their complements up to full combat readiness, the armourers of the air groups worked round the clock to convert the Sea Harriers to fire AIM-9L Sidewinders, using software information (for their fire-control systems) sent over the secure satellite communications link from CinC Fleet Northwood, and to clear the aircraft to carry naval 51-mm (2-in) rocket pods, BL755 cluster bombs and Lepus parachute flares for the first time. At the same time the fitters worked to bring all the aircraft to combat readiness and practised the battle repair techniques that would be vital in keeping aircraft flying. In the meantime the planners and intelligence staff worked in their own worlds with their own sets of problems. The planners quickly appreciated that without any organic airborne early warning capability the fleet would be highly vulnerable to air attack by low-level raiders, and would also be seriously limited in the effectiveness of the air cover that it could make available for the landing beaches. They also had to cater for the threat of the Argentinian fleet, especially the carrier *Veinticinco de Mayo*, and the limitations in the squadrons embarked as the Sea Harriers initially did not carry any of the chaff or infra-red decoy launchers that are so vital in modern air combat. Moreover, the pilots were not fully trained for counter-air or ground-attack missions using the ordnance available.

However, it was the Argentinian carrier with its squadron of McDonnell Douglas A-4Q Sky-


Above: The workhorse of the assault helicopter squadrons, the Sea King HC.4, lands on HMS Hermes during the passage south to the Maritime Exclusion Zone set up around the Falklands.

Below: HMS Illustrious *takes over from HMS* Invincible *near the Falklands after the former had hurriedly been readied for sea during the course of the fighting. The escort is the guided missile destroyer HMS* Bristol.



Above: The sea conditions in the South Atlantic are typified by this picture of HMS Hermes *smashing her way through a heavy swell. In conditions such as this the Sea Harrier force remained operational.*

hawk attack aircraft that had been trained in the specialist art of attacking warships, and this was the most important unknown quantity. In mid-April, as the main British carrier force closed on the Falklands exclusion zone, the recapture of South Georgia was undertaken. On 21 April the Argentinians gained positive knowledge of the British force's whereabouts when an Argentinian air force Boeing 707 on a reconnaissance mission was intercepted 240 km (150 miles) south of the carriers by a Sea Harrier from the *Hermes.* Once alerted the Argentinians made their preparations over the next few days to combat the Royal Navy. On 29 April the *Veinticinco de Mayo* (with eight A-4Q, six Grumman S-2E Trackers and four Sikorsky SH-3D helicopters embarked) slipped away to sea with an escort of the two Argentinian Type 42 destroyers *Hercules* and *Santissima Trinidad* plus four smaller frigates and destroyers, heading towards a position north-west of the Falklands and just outside the Total Exclusion Zone, where it was ideally placed to intercept the British force. On 1 May, in the hours before dawn, the RN armourers on the *Hermes* worked to arm her 12 Sea Harriers with 454-kg (1000-lb) bombs and CBUs for the two air strikes on Port Stanley airfield and Goose Green that were to follow the initial attack by a single RAF Avro Vulcan bomber. The *Invincible* in the meantime, because of her more modern radar and smaller air detachment, was tasked to provide a six-aircraft combat air patrol (CAP) to cover the return of the strikes and the fleet. The launch of the strike and its subsequent recovery, with only one aircraft suffering minor damage, provided a major boost to morale all round. At the same time that the Sea Harriers were performing, the carriers initiated in earnest a round-the-clock ASW screen of three Sea Kings with sonobuoy

Below: HMS Invincible *steams at speed in the operational area. A minimum of 15-20 knots was maintained at all times to avoid submarine attack, whilst a defensive zig-zag pattern was followed.*

The distinctive shape of HMS* Hermes*, with a Westland Sea King HC.4 delivering an underslung load of stores. Considerable cross-decking of men and material was undertaken by the helicopters during the trip south.

and dunking sonar at a distance of some 11-20 km (7-12 miles) ahead of the main fleet body with a fourth Sea King assigned to the surface radar sweep role out to 320 km (200 miles) for enemy ships. During this period one of the three Sea Kings from the *Hermes* that had been detached to help in the hunt for the Argentinian submarine *San Luis* (being conducted some 290 km/180 miles away) set a new world record for an ASW mission of over 10 hours in the air. The three 'choppers' had taken spare crews along and lowered them to the decks of the two frigates assigned to the hunt: the relief crews were picked up as the first crew tired, and the helicopters were also refuelled in flight from the deck via hoses whilst maintaining position over the stern of the vessels.

During the afternoon of 1 May both the carriers' Sea Harriers scored kills as the Argentinian air force began to probe and attack the fleet. It was not until after dark on 1 May that the *Veinticinco de Mayo* battle group set course towards the estimated position of the task force, launching several Trackers at 20.00 for long-range reconnaissance. In a scene reminiscent of the Pacific carrier battles of World War II, the two opposing carrier forces began what appeared to be a classic carrier encounter. Just before midnight one of the Trackers located the British vessels on radar some 480 km (300 miles) south east of the Argentine group and 240 km (150 miles) north of Port Stanley. Once alerted the A-4Q Skyhawks were made ready for a dawn strike loaded with 227-kg (500-lb) Mk 82 Snakeye retarded general-purpose bombs, and the carrier group headed towards a launch position some 320 km (200 miles) away from the target. It was also just after midnight that a Sea Harrier from the *Invincible* located the Argentinian carrier group whilst following up an Elint intercept. But as dawn broke there occurred one of the twists of fate that nobody can predict, when the Argentinians found that the wind, normally strong in these latitudes at this time of the year, had dropped to the point where the fully loaded Skyhawks could not be catapulted off safely with any chance of returning to the carrier after the attack. Thus the attack was postponed. However, as the cruiser *Belgrano* was sunk later in the day by a patrolling British nuclear-powered attack submarine the carrier group was ordered back to the safety of the Argentinian coastal waters, so playing no further part in the conflict although her air group was disembarked with the A-4Qs later scoring several successes against the Royal Navy warships. What countermeasures the RN was to take against the Argentinian carrier during the possible first carrier versus carrier battle since World War II have never been revealed. During the next few weeks the two British carriers settled in to the routine of CAPs, ground-attack missions and reconnaissance sorties, embarking replacements and reinforcements whenever and wherever they arrived. The *Hermes* and her RAF Harriers undertook the bulk of the ground-support missions. On 19 May the *Hermes* detached herself and headed towards the mainland to launch a special mission Sea King HC.Mk 4, which ultimately crashlanded on the Argentinian border. During the San Carlos landings the two carriers were stretched to the limit providing CAPs which, although shooting down a number of aircraft and preventing others from completing their missions, were not totally effective in preventing aircraft leaking through. On 25 May the *Invincible* distinguished herself by firing six Sea Dart missiles within two minutes during the Exocet attack which sank the *Atlantic Conveyor.* However, none of the Sea Darts actually hit an enemy aircraft and it has been unofficially reported that one nearly 'shot down' the *Hermes*, whilst a second is reputed to have destroyed a Sea Wolf missile in flight whilst that missile was engaging one of the two Exocets fired; where the other four Sea Darts went nobody seems to be sure.

In the last major attack on the fleet on 30 May the *Invincible* was the target for an Exocet attack and four bomb-carrying A-4C Skyhawks. The former missed and two of the latter were shot down on the run in before bomb release, but the Argentinians claimed to have damaged the *Invincible* seriously. Since the other two aircraft missed with their loads all the *Invincible* suffered by way of damage was an affront to her dignity.

What the Falklands proved to carrier operations was that the secret of success in any air-sea battle is the judicious use of the balanced air assets which should be available, as short cuts and cost-cutting exercises lose men, aircraft, ships and ultimately the battle.

The crowded flight deck of HMS* Hermes *on the way to Ascension Island. The Sea Harriers in the foreground are about to undergo camouflage painting to rid them of any high visibility markings, as are the helicopters.

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ROYAL NAVY
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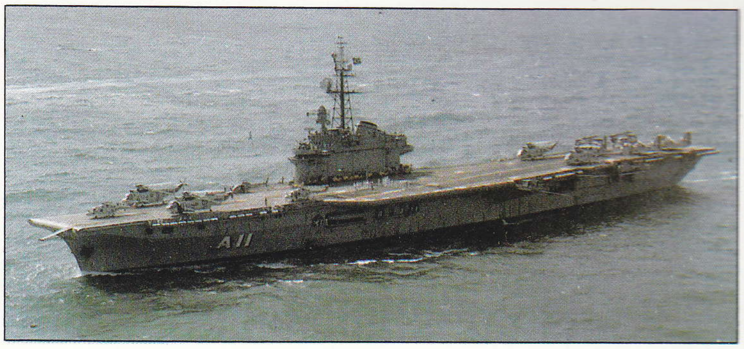
BRAZIL

Minas Gerais

A sistership of the Argentinian *Veinticinco de Mayo*, the ex-*Vengeance* started life in the Royal Navy in 1945. Three years later she was fitted out for an experimental cruise to the Arctic and was then lent to the Royal Australian Navy in 1953. She was returned to the Royal Navy in 1955 and was purchased by Brazil in December 1956 as the ***Minas Gerais.*** She was transferred to the Netherlands, where she was comprehensively refitted between 1957 and 1960 with new weapons, a 13365-kg (29,465-lb) capacity steam catapult, an 8½° angled flight deck, a mirror sight deck landing system, a new island superstructure, new US radars and two centreline aircraft elevators. The hanger is 135.6 m (445 ft) long by 15.8 m (52 ft) wide and 5.3 m (17 ft 6 in) high. In 1976-81 the carrier underwent another refit to allow her to operate through to the 1990s. A data link system was installed so that the carrier can co-operate with the 'Niteroi' class of frigates in service with the Brazilian navy, and the obsolete American SPS-12 radar was replaced with a modern SPS-40B two dimensional air-search system. The role of the *Minas Gerais* throughout her service with the Brazilian navy has been anti-submarine warfare with an air group (since the late 1970s) of eight Grumman S-2E Trackers of the Brazilian air force (the Brazilian navy is not allowed to operate fixed-wing aircraft) plus four navy Sikorsky SH-3D Sea King ASW helicopters, two Aérospatiale SA530 Ecureuils and two Bell 206 JetRanger utility helicopters. It is reported that when the *Minas Gerais* is eventually paid off the Brazilians will replace her with two carriers capable of operating a mixed air group of V/STOL fighter/strike aircraft and ASW helicopters.



A recent view of Minas Gerais *with four S-2E Trackers, four SH-3D Sea Kings, two Lynx and an Ecureuil ranged on the flight deck. A more modern V/STOL carrier design is currently under study to replace her in the late 1980s/early 1990s.*

Specification

Displacement: 15,890 tons standard, 19,890 tons full load
Dimensions: length 211.8 m (695 ft); beam 24.4 m (80 ft); draught 7.5 m (24.5 ft); flightdeck width 37.0 m (121 ft)
Machinery: two-shaft geared steam turbines delivering 40,000 shp (29830 kW)
Speed: 25.3 kts
Armament: two quadruple 40-mm AA, and one twin 40-mm AA
Aircraft: see text
Electronics: one SPS-40B air-search radar, one SPS-4 surface-search radar, one SPS-8B fighter direction radar, one SPS-8A air control radar, one Raytheon 1402 navigation radar and two SPG-34 fire-control radars
Complement: 1,000 plus 300 air group

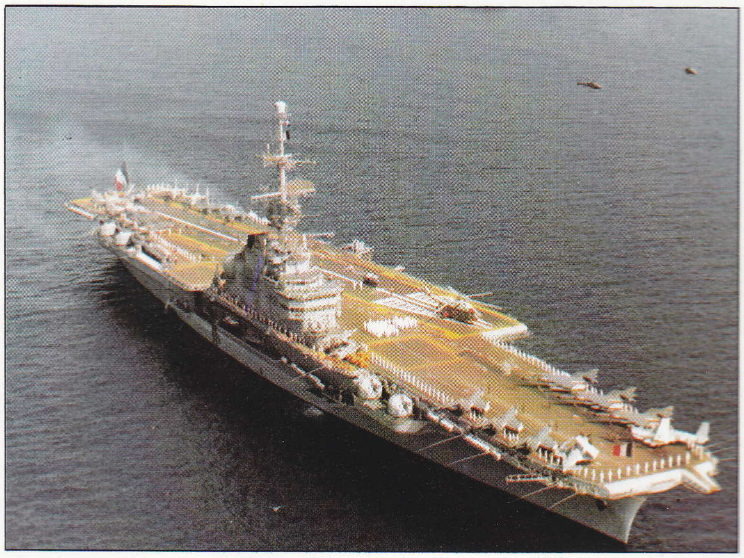
FRANCE

'Clemenceau' class

The ***Clemenceau*** was the first carrier designed as such to be completed in France. Built in the late 1950s and commissioned in November 1961, she incorporated all the advances made in carrier design during the early 1950s, namely a fully angled flight deck, mirror landing sight and a fully comprehensive set of air-search, tracking and air-control radars. The flight deck is 165.5 m (543 ft) in length and 29.5 m (96 ft 9 in) in width, and is angled at 8° to the ship's centreline. Two aircraft lifts, each rated at 2036 kg (44,895 lb) are provided, one abaft the island on the deck edge and the other offset to starboard and just forward of the island. Two steam catapults are fitted, one on the port side of the bow and the other on the angled flight deck. The hangar has a usable area of 152 m (499 ft) by 24 m (78 ft 9 in) by 7 m (23 ft). The fuel capacity of the *Clemenceau* is 1200 m^3 of JP5 aircraft fuel and 400 m^3 of AVGAS whilst her sistership, the ***Foch*** (commissioned in July 1983), carries 1800 m^3 and 109 m^3 respectively. During the period September 1977 to November 1978 the *Clemenceau* underwent a major refit, the *Foch* following between July 1980 and August 1981. During these refits both ships were converted to operate the Dassault-Breguet Super Etendard strike fighter, for which they carry AN52 15-kt tactical nuclear gravity bombs in their magazines. They also receive SENIT 2 automated tactical information-processing systems as part of their command, control and communication suites. Following the refits the two carriers' air groups now each comprise 16 Super Etendard strike fighters, three Dassault-Breguet Etendard IVP photographic reconnaissance fighters, 10 Vought F-8E Crusader interceptors and seven Breguet Alizé ASW aircraft, plus two Aérospatiale Super Frelon ASW and two Aérospatiale Alouette III utility helicopters. The carriers can also act, if required, as helicopter carriers with an air group of 30-40 helicopters depending upon the types embarked. During the Lebanon crisis of 1983 France used one of the carriers in support of her peace-keeping force, Super Etendards being used to attack several gun positions that had engaged French troops. Under current planning the *Clemenceau* is to be paid off in 1992 and the *Foch* in 1998. Their replacements will be two 34,600-ton nuclear-powered carriers, the first of which is to be laid down in 1986 at Brest.

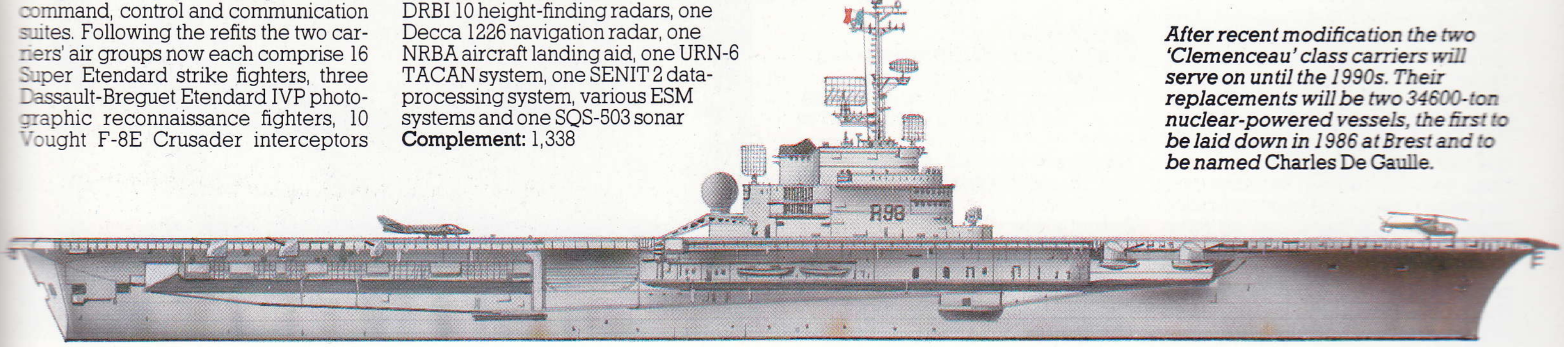
Specification

Displacement: 22,000 tons standard, 32,185 tons full load (*Clemenceau*) or 32,780 tons full load (*Foch*)
Dimensions: length 265 m (869 ft 5 in); beam 31.7 m (104 ft) with bulges; draught 8.6 m (28 ft 3 in)
Machinery: two-shaft geared steam turbines delivering 126,000 shp (93960 kW)
Speed: 33 kts
Armament: eight 100-mm (3.9-in) DP
Aircraft: see text
Electronics: one DRBV 50 surveillance radar, one DERBV 23B air-search radar, one DRBV 20C air-warning radar, two DRB 31 fire-control radars, two DRBC 32 fire-control radars, two DRBI 10 height-finding radars, one Decca 1226 navigation radar, one NRBA aircraft landing aid, one URN-6 TACAN system, one SENIT 2 data-processing system, various ESM systems and one SQS-503 sonar
Complement: 1,338



Above: Seen entering Nice, Clemenceau *and her sister provided air support to the French contingent in Lebanon in 1983.*

Left: The 'Clemenceau' class were the first French vessels to be designed from the outset as aircraft carriers, incorporating all the design lessons learned in the 1950s.



After recent modification the two 'Clemenceau' class carriers will serve on until the 1990s. Their replacements will be two 34600-ton nuclear-powered vessels, the first to be laid down in 1986 at Brest and to be named Charles De Gaulle.

SPAIN

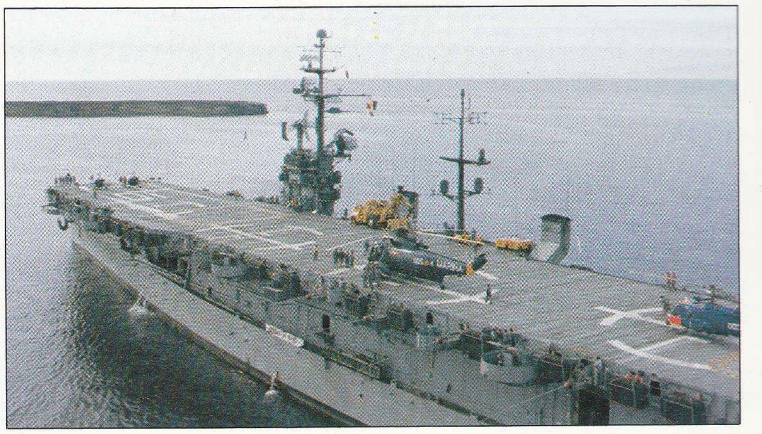
Dédalo and *Príncipe de Asturias*

The ***Dédalo*** is an ex-US 'Independence' class carrier built during World War II that ended her days in the US Navy as an aviation transport. She was reactivated and modernized as a carrier at the Philadelphia Naval Shipyard before being transferred to Spain on a five-year loan from 30 August 1967. In December 1975 the *Dédalo* was purchased outright and now acts as the Spanish navy's fleet flagship. Her flight deck is 166.1 m (545 ft) long and 32.9 m (108 ft) wide, and the hangar can accommodate 18 Sikorsky Sea King type helicopters with another six on the flight deck. The *Dédalo*'s normal air wing comprises four air groups with at least one with eight BAe Matador V/STOL fighters, one with four SH-3D/G Sea King ASW helicopters, one with four Agusta (Bell) AB.212 ASW anti-submarine and electronic warfare helicopters, and one of four helicopters as required by the mission assigned to the carrier (these could, for example, be four Bell AH-1G Cobra attack helicopters to support an amphibious landing). A maximum of seven four-aircraft groups can be handled aboard.

To replace the *Dédalo* in 1986, the Spanish ordered on 29 June 1977 a gas turbine-powered vessel based on the final design variant of the abortive US Navy's Sea Control Ship. Named ***Príncipe de Asturias***, the new ship has a flightdeck measuring 175 m (574 ft) in length and 30 m (98 ft 6 in) in width, fitted with a 12° ski-jump ramp blended into the bow. Two aircraft lifts are fitted, one of them at the extreme stern. For the *Príncipe de Asturias*' air wing Spain has ordered the McDonnell Douglas AV-8B Harrier II V/STOL fighter and the Sikorsky SH-60B Seahawk ASW helicopter. The complement of aircraft and helicopters will be 20, made up of six to eight AV-8Bs, six to eight SH-3s or SH-60s, and four to eight AB.212s, the actual mix depending upon the operational requirement. A fully digital command and control system is fitted with a LINK 11 intership data transmission terminal. It is expected that a second vessel of this type will be ordered later.

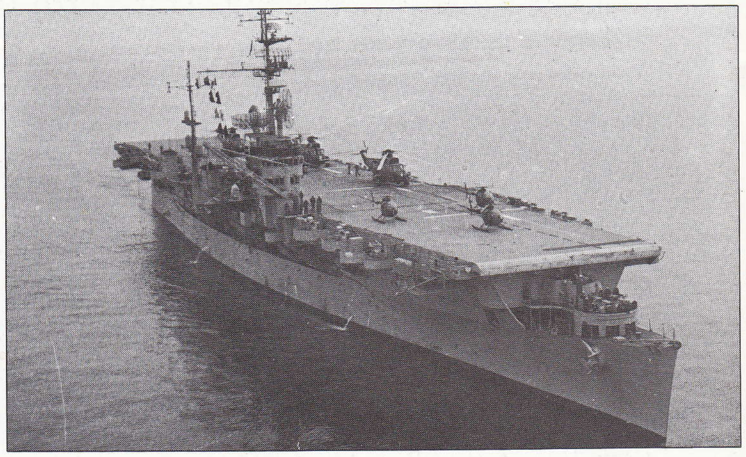
Specification
Dédalo
Displacement: 13,000 tons standard, 16,416 tons full load
Dimensions: length 189.9 m (623 ft); beam 21.8 m (71 ft 6 in); draught 7.9 m (25 ft)
Machinery: four-shaft geared steam turbines delivering 100,000 shp (74570 kW)
Speed: 24 kts
Aircraft: see text
Armament: one quadruple 40-mm AA, and nine twin 40-mm AA
Electronics: one SPS-8 3D radar, one SPS-6 air-search radar, one SPS-40 air-search radar, one SPS-10 surface-search and tactical radar, two Mk 29 fire-control systems, two Mk 28 fire-control systems, two navigation radars, one URN-22 TACAN system, one WLR-1 electronic countermeasures system
Complement: 1,112 without air group

Specification
Príncipe de Asturias
Displacement: 14,700 tons full load
Dimensions: length 195.1 m (640 ft); beam 24.4 m (80 ft); draught 9.1 m (29 ft 10 in)
Machinery: one-shaft gas turbine (two GE LM 2500) delivering 46,000 shp (34300 kW)
Speed: 26 kts
Aircraft: see text
Armament: four Meroka 20-mm CIWS
Electronics: one SPS-55 surface-search radar, one SPS-52 3D radar, four Meroka fire-control radars, one SPN-35A air control radar, one URN-22 TACAN system, four Mk 36 Super RBOC chaff launchers
Complement: 790 without air group



Above: The elderly Spanish carrier Dédalo *was converted from an ex-US World War II carrier of the 'Independence' class. Currently the flagship of the Spanish fleet, she is due to be replaced by an indigenous-built version of the US Sea Control Ship design.*

Below: As USS Cabot, Dédalo *survived a kamikaze attack during the Battle of Leyte Gulf. Spanning naval generations, she is today one of the few ships to operate V/STOL aircraft on a regular basis.*



ITALY

Giuseppe Garibaldi

Essentialy designed as a gas turbine-powered carrier for helicopters the ***Giuseppe Garibaldi*** also incorporates features suiting her for the carriage and operation of V/STOL fighters. The flight deck is 173.8 m (570 ft 2 in) long and 21 m (68 ft 11 in) wide, and is fitted with a ski-jump ramp. The hangar is 110 m (360 ft 11 in) long, 15 m (49 ft 3 in) wide and 6 m (19 ft 8 in) high, and is built to accommodate 12 Agusta (Sikorsky) Sea King ASW helicopters, or 10 V/STOL aircraft and one Sea King, although the available height will permit the embarkation of heavy-lift Meridionali (Boeing Vertol) CH-47 Chinook helicopters if required. Two aircraft lifts are fitted (one forward and one abaft the island), and there are six marked flightdeck spaces for helicopter operations. The *Giuseppe Garibaldi* was designed specifically to provide ASW support for naval task forces and merchant convoys, and as such is fitted with full flagship facilities plus command, control and communication systems for both naval and air force operations. In emergencies she can also carry up to 600 troops for short periods. The extensive weaponry fitted also allows her to operate as an independent surface unit. To permit helicopter operations in heavy weather she has been fitted out with two pairs of fin stabilizers, and her aircraft maintenance facilities are sufficient not only to service her own air group but also the light ASW helicopters of any escorting warships. It is planned to commission her in 1985 to replace both the 6,500-ton 'Andrea Doria' class helicopter-cruisers. It is not yet known if Italy will eventually buy V/STOL fighters for her air group, the naval budget already being hard pushed just to provide enough ships to modernize the fleet.

Specification
Displacement: 10,100 tons standard, 13,139 full load
Dimensions: length 179 m (587 ft 3 in); beam 30.4 m (99 ft 9 in); draught 6.7 m (22 ft)
Machinery: two-shaft gas turbine (four Fiat/GE LM2 500) delivering 80,000 hp (59655 kW)
Speed: 30 kts
Aircraft: 12 SH-3D Sea King helicopters with space on flight deck for six more
Armament: six Teseo Otomot Mk 2 SSM launchers (12 missiles), two octuple Albatros short-range SAM systems (56 missiles), three twin 40-mm Dardo CIWS, two triple 325-mm (12.75-in) ASW torpedo tubes for Mk 46 and Whitehead AS244/S torpedoes
Electronics: one RAN 3L 3D radar, one RAT 31 air-search radar, one RAN 10S air-search radar, one SPS 702 surface-search radar, three RTN 20X Dardo tracking radars, two RTN 30X Albatros fire-control radars, one SPS 703 navigation radar, one TACAN system, one IPN 10 data-processing system, various passive ESM systems, two SCLAR chaff launchers and one DE 1160 sonar
Complement: 550 normal, 825 maximum including air group

The first Italian aircraft-carrier to actually see service, the Giuseppe Garibaldi *is designed to carry V/STOL fighters, although her air group will actually consist of Sea King ASW helicopters for the foreseeable future as the Italian navy is short of funds.*